JUL 13 1933

The ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXII
No. 2901

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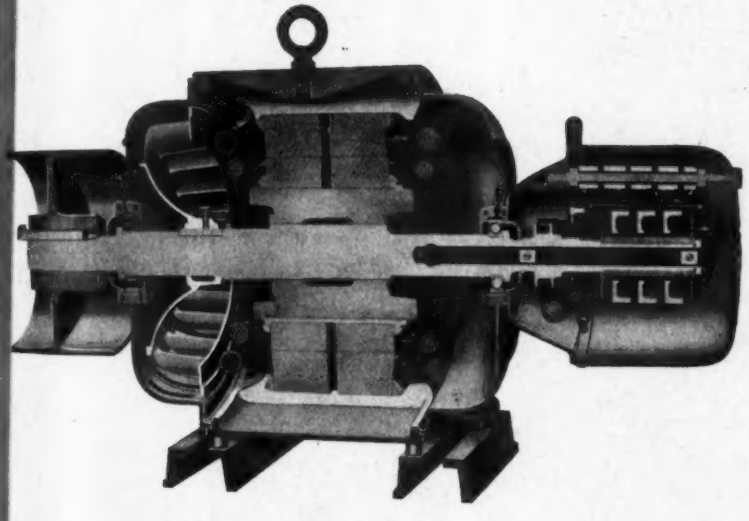

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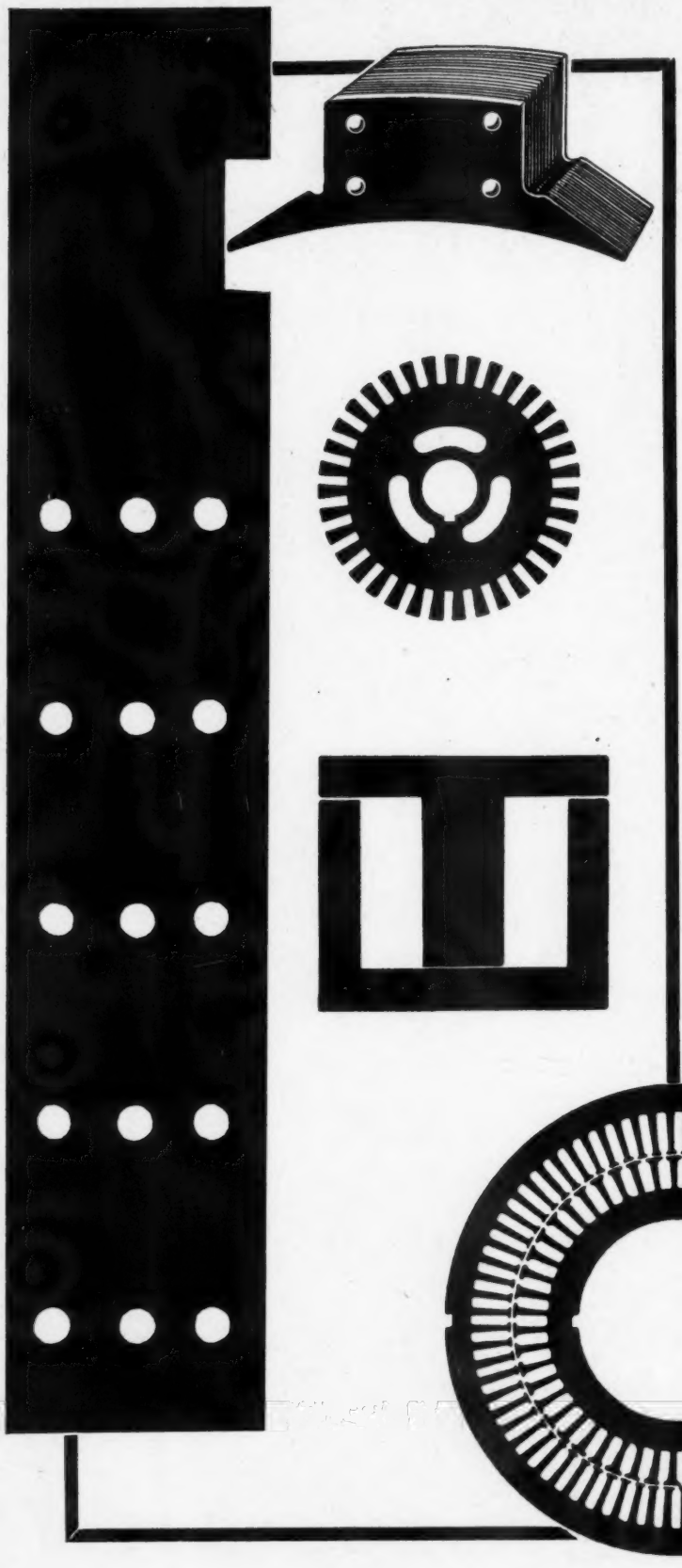

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The
Electrical Review

VOL. CXII. JUNE 30, 1933 No. 2901.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Power in Industry

THE technical sessions of the Sectional Meeting of the World Power Conference began yesterday with papers and discussions on a subject that is of greater topical moment in Great Britain than any of the other matters to be dealt with in Stockholm.

The supply of electricity for large-scale industry is of a very practical importance to us for two reasons: first, we—more than any other country—depend for our prosperity on manufacturing processes, in which electrification is essential to efficiency; secondly, we have now a national electrical system, the grid, the ultimate success of which is bound up with that of industry, since the power load is still by far the greatest, and the development of other loads, such as domestic and transport, will be largely affected by the incomes of wage-earners.

Yet we still lag behind some of our competitors in the amount of power used per worker. Although an inference drawn from a rigid comparison between the United States and ourselves is likely to prove fallacious, due to a difference in industrial conditions, the discrepancy is wide enough to call for criticism. The margin of America's advantage appears, significantly, to be equivalent to the amount by which her industries are more completely electrified than ours.

As electricity becomes more generally available we may expect a reduction in the amount of mechanical power that is directly applied in favour of the electric motor, but surely even to-day the retention of over three million h.p. of reciprocating engines cannot be justified. The paper presented before Section 1 by Messrs. H. Hobson, F. Forrest and C. D. Taite (reported by us in a later page) is likely to be regarded as a small classic in concise statement of the case for taking a supply of electricity from the public mains. In drawing attention at the same time to the effect of the grid scheme on the provision of power for industry, the authors reinforce their contentions, as the broad principle is the same.

Many of the arguments advanced show how necessary it is, when negotiating power contracts, to have an inside knowledge of the consumer's own problems, and also how much scope there is for a bold and imaginative treatment of the supply question. An arrangement that has been successfully adopted, as mentioned by the authors, whereby the supply authority takes over a private plant, also provides a convincing illustration of the sincerity of the claim of the undertaking to provide a better and cheaper service.

We believe that it will become more than ever necessary to interpret statutory provisions regarding special rates in the light of modern needs rather than in relation to the small lighting requirements of fifty years ago.

The principles laid down in the paper can be amplified or modified to suit local circumstances, but the most important point, on the broadest grounds, is that every new connection brings nearer the possibility of a reduction in prices.

The Engineer-Economist

THE claim of the engineer to a voice in national and world government is once again put forward in a book, "Forward from Chaos" (Nisbet, 6s. net), by Mr. A. P. Young, manager of the Rugby works of the B.T.H. Co. In this the growth of industry is traced, and the author considers that things have reached such a pitch that there will have to be a fundamental change in the basis of industrial activity—from profit to service (which does not necessarily mean no profit). He shows that some form of control has become imperative, and proposes for each major industry a planning control board, and above these

a national planning control board. He is compelled to go farther than this and visualises an Empire board, and ultimately a form of international control. Production methods are such as to enable all that is wanted to be made by far fewer workers than are available, unless hours are reduced to enable more men to be employed. Consequently, he proposes a reduction of hours by 10 per cent. (in the first place), accompanied by a reduction of only 5 per cent. in wages, and shows from experience that this is quite economical. By this means he would find work for a further 1¼ million people. The book is worthy of serious attention, although in its international implications there are many things not fully considered. But, as Mr. Young says, "The start is everything."

A Big Job

WHAT is without doubt the largest scheme of road traffic co-ordination ever planned enters upon its first practical stage to-morrow (July 1st). Lord Ashfield and his colleagues on the London Passenger Transport Board have the colossal task of welding into one great system the "Underground" railways, the buses and the trams within a radius of thirty miles from Charing Cross—to say nothing of the suburban railway services—a matter which had become urgent if London traffic was to continue to move at all and to move economically. We trust that the resultant elimination of superfluous services and wasteful competition will give the public of the Metropolis quicker and cheaper travel. We also look forward to a speeding-up of the schemes for the electrification of suburban lines, consideration of which has been delayed pending the commencement of the Board's operations.

The Transport Situation

As at the recent Conference of the Tramways and Light Railways Association, there was much diversity of opinion at the Municipal Tramways Association Convention regarding the correct form of transport to meet modern conditions, but there seemed to be a growing appreciation of the electric trolley bus. This vehicle seems to steer clear of many of the tramcar's drawbacks while possessing a number of virtues which the motor bus lacks, and the fact that its use involves more work for the electrical industry is a further very important point in its favour. Another prominent matter common to the discussions at both conferences was that of co-ordination. The reorganisation of London transport which is about to commence has made the provinces wonder if something similar should not be done in their case. Such a consideration involves the question of the future of the three associations which now cater for road transport authorities. Already there seems to be a fairly widespread feeling that three associations are two too many, and schemes of co-ordination on a large scale would make this even more apparent, for trams and buses, companies and municipalities would find themselves inextricably mixed.

The Fuel Returns

THE returns relating to the "Generation of Electricity in Great Britain" for 1932 (Stationery Office, 1s. 6d.) have reached us just as we go to press. The increased kWh output of 6.58 per cent. over 1931 was obtained at the cost of only 2.49 per cent. additional fuel. In steam stations the coal fired per kWh generated was 1.74 lb., compared with 1.82 lb. in the previous year; oil engines improved to 0.82 lb. from 0.87 lb. Only the few producer-gas stations showed a decline, *i.e.*, 2.25 from 1.94 lb. The highest thermal efficiency is, as usual, gained by an oil-engine station—Buxton, with 30.64 per cent. Clarence Dock (Liverpool) claims the record of 24.72 per cent. thermal efficiency for coal-fired stations (kWh generated), and thus succeeds Deptford West in the premier position, although the latter (24.55 per cent.) surpassed its last year's performance (24.02 per cent.). Portishead (Bristol) beats Kearsley's figure of last year (1.2 lb.) for the lowest weight of coal with 1.15 lb. per kWh generated. These are excellent results, but they are likely to be exceeded this year, as for the first four months (as previously reported by us) both Clarence Dock and the reconditioned Thornhill (Y.E.P.) have given even better thermal efficiencies, the figure for the former station being 25.98 per cent. and for the latter 25.64 per cent.

Little by Little

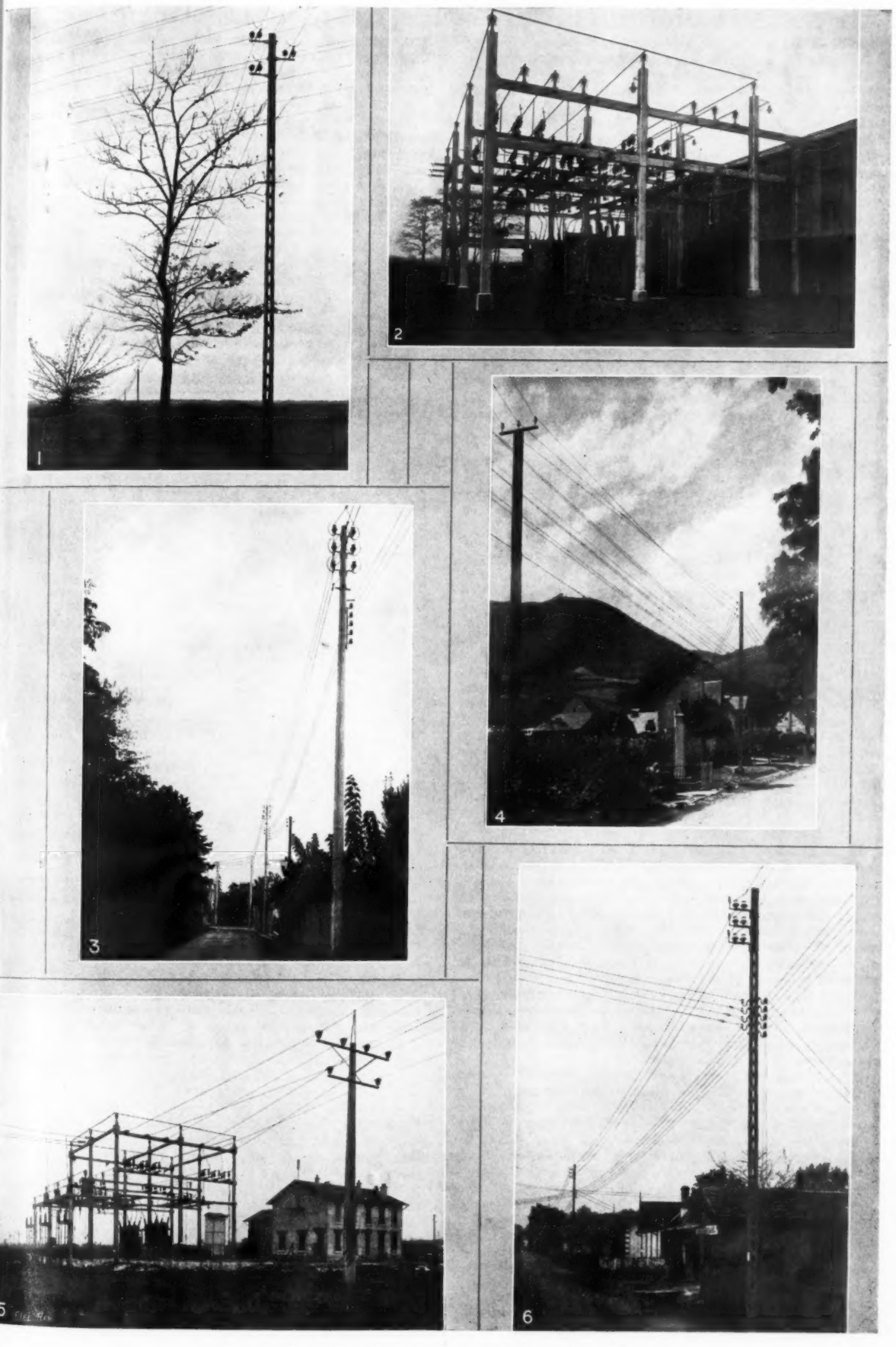
IN the report for 1932 of the Inspector of Mines for the North Midland Division (Stationery Office, 1s.) attention is drawn to an increase of 5,696 h.p. (6 per cent.) in electrical machinery underground and 1,779 h.p. (2 per cent.) on the surface. The significance of this is that during the same period the output of coal declined by 6½ per cent., which appears to indicate that some of the colliery owners are taking the opportunity offered by the present depressed conditions, in which few mines are working two full coal-winding shifts, to reorganise their driving methods. Support is lent to this view by the activity noticed by the Inspector (Mr. J. R. Felton) in improving lighting at several mines, especially in the main roadways. The number of electric safety lamps has increased, most of the new ones being of the cap type; this is gratifying, as these lamps appear to us to have advantages that would have warranted a much more widely extended use in the past. Another small improvement that is bringing considerable satisfaction to the miners, owing to the higher candle-power available, is the substitution of 4-V for 2-V lamps in several pits.

Sir Hugo Hirst's Speech

THE position held in the British electrical industry by the General Electric Co., Ltd., invests the statements by Sir Hugo Hirst, Bt., at the company's annual meetings with more than usual interest. On Wednesday Sir Hugo surveyed the developments in the wide field covered by the company, and made some cogent remarks on existing conditions. He refuted the idea that the British electrical manufacturers had made a lot of money out of the grid contracts; all they got was a great deal of experience and hope for the future. He was justified in pointing to the favourable position of the company, whose profit had shown but a small decline, while similar concerns abroad were losing millions. He did not seem to expect a great deal from the World Economic Conference, although he thought that even small results were better than none. The outcome of the Ottawa Conference had not met his expectations, but he hoped that the Dominions would redeem their pledges in due course. While he thought that the full effect of the false economy campaign had not yet been felt, Sir Hugo said that there were opportunities and signs of betterment in various directions.

Service or Supersession

A CONTRIBUTOR to this issue takes the line that, contrary to the usual assumption, it is not so much publicity by a central body that is needed to spread the use of electricity as a real effort on the part of the individual supply undertakings. He claims that the public is already imbued with the "electrical idea," and only awaits reasonable terms and adequate service. In fact, its ideas are often in advance of those of the supply undertakings. If this is true—and who can deny it so far as very many undertakings are concerned—what is the remedy? Our contributor sets forth a list of requirements to which all electricity supply concerns should conform, and suggests that if they do not their powers should be exercised by some other body. This seems eminently reasonable, but we trust that it will not become necessary to supersede entirely the local distributors, who, after all, should know their public and its requirements more intimately than the most efficient of national organisations. Still, they have got to awake to a proper realisation of their responsibilities.



Rural Electrification in France (see page 933)

1. Light concrete pole and three-phase h.p. distribution line. 2. The 60/10-kV sub-station of the Union Hydro-électrique. 3 and 6. Concrete poles bearing a 10-kV line above and a l.p. distribution line below. 4. Light concrete poles in a village. 5. The North-East Paris Co.'s switching station at Thillay.

System Reliability. By William T. Taylor, M.Inst.C.E., M.I.E.E.

POTENTIAL rises which accompany faults to earth in a.c. systems are intimately dependent upon the system insulation, voltage, system connections, type of arrestor, class and length of line, and whether a reactive protector is used. Arcing earth faults propagate dangerous discharge surges in the accidentally earthed phase of a h.v. isolated-neutral system, whereas a momentary excess potential may cause no trouble in the sound phases of a solid-earthed neutral system. The magnitude of the arc-fault current of the isolated-neutral system is dependent upon the position of the fault on the line, whereas the neutralising and compensating merits of the earthed neutral system with reactive protector is independent of the position of the fault on the line. In long h.v. lines, however, it is better to distribute the reactors in order to limit the maximum voltage to earth on the sound phases. The use of the earthed-neutral suppresses abnormal potential rises, allowing a lower test pressure on lines and transformers, and permitting the use of one terminal per single-phase transformer; it also prevents the breaking down of insulation in various parts of the system at widely separated points.

The system with its neutral earthed through a reactor has all the merits of solid earthing and also permits of satisfactory operation during a phase fault to earth. Earthing the neutral is the most effective method of anchoring the system pressure at normal, and this practice is as much a line problem as it is a transformer problem. For greatest flexibility and safety, the properly installed and operated wood-pole line is superior to the steel-pole line. Single phase transformer units are the most flexible and desirable for earthed neutral connection on the h.v. side, but the three-phase unit is best for the isolated neutral because of unbalance in the magnetic circuits.

Compared with lower-voltage systems, the insulation of the 132-kV grid and high voltage lines operating with earthed-neutral and supported on wood poles and frames is electrically stronger and better protected against destructive action due to arcing earths, and less sensitive to the same relative potential rises caused by lightning and other atmospheric disturbances; also, abnormal potential rises are relatively less dangerous than with steel poles or towers, and there is a possible damping of excess potentials owing to line corona. Less insulated lower-voltage lines (such as the 66-kV line strung on wood poles properly used and operated with solid earthed neutral) are as safe from atmospheric disturbances as 132-kV lines strung on steel poles. For still lower voltages, such as 11-kV primary distribution lines with earthed neutral, the relative insulating factor and robustness of construction are less, the ratio of protection is lower, and possible interruption of service greater than the higher-voltage lines.

Earthed Neutral and Insulated Systems

Advantageous as solid earthing of the neutral is for e.h.v. and l.v. systems, some modification is needed for intermediate voltages because of the relatively greater number of faults to earth and service interruptions as compared with the relatively higher-voltage and better insulated systems. With an accidental phase fault to earth, the resulting rush of current is usually the cause of service interruption. An effective method of protection against single-phase faults to earth, which are about 80 per cent. of the total number of faults, is to place in series with the neutral earth connection an inductive type of protector capable of putting an end to excess potential rises, reducing the fault current at the arc, lowering the potential to earth, and suppressing disturbances sufficient to permit satisfactory provisional operation.

The h.v. isolated-neutral system being virtually an *insulated* system carries static charges which may be dangerous. This system is less reliable than the earthed-neutral system because of the ever present danger of trapped static charges and of intermittent arcing earth faults, which cause destructive potential rises and a multiplicity of insulation breakdowns on other parts of the system. One accidentally earthed phase is all that is required to start a series of troubles, and an earthed phase is sometimes not noticed until something more serious happens. The installation of surge-proof transformers and individual pole line protection is helpful to line and arrestors against atmospheric disturbances. For a phase fault to earth, where propagation of potentials arises due to intermittent arcing at the fault, there is also the danger of the arc softening or annealing and weakening the conductor every time such a fault occurs as the result of a cracked insulator.

It is impossible always to protect the l.v. side of an isolated-neutral system from h.v. crosses and certain other abnormal potential rises, but it is always possible to protect the multiple-earthed system from similar potentials. Excess and abnormal potentials on the l.v. secondary side are very dangerous, and as ineffective insulation of wiring, apparatus, appliances or plant is more prevalent and/or more dangerous than ineffective earth connection, multiple earthing should be the practice. Where high voltage is accidentally impressed on a l.v. system the insulation of the latter is sure to break down at one or more weak spots, *i.e.*, in a motor or iron-clad switch or lighting fixture, and thus make non-current carrying parts alive. This is practically impossible where the secondary system is effectively multiple earthed; both primary and secondary fuses under such a fault condition are in the same current path to earth and the primary (h.v.) fuse, being of very much lower rating than the secondary fuse, will instantly clear the circuit.

Earthing the non-current carrying parts of motor or switch, without earthing the neutral may increase the danger, so that the best course is to earth both the neutral and the non-current carrying parts to secure the highest degree of protection against dangerous potentials and burn-outs as also the highest degree of safety to life. The hazards of this system under l.v. (230-V) normal operation are more uncertain than with the earthed-neutral system which possesses the inherent requirements for protection and safety from both terminal and induced voltages and accidentally impressed high voltages.

Potential Rises and Arc-overs

Most disturbances on h.v. and l.v. systems are caused by an arc-over from one phase conductor to earth and current rises to earth. The more dangerous system potentials arise mainly from arcing earths and atmospheric disturbances, and sometimes from switching-in open-circuited high voltage long distance transmission lines. For the two general systems referred to herein, the relative abnormal system conditions for phase fault to earth, etc., are :—

	System.	Conditions.
(A.)	Earthed-neutral system with inductive protector.	Safe reduction or almost total absence of current flow to earth, compared with (A.1.). Safe reduction or almost complete neutralisation of potential stresses to earth, compared with (B). Fault current independent of position of the fault. Suited to single-phase and polyphase transformer units. Satisfactory operation with phase fault to earth.
(A.1.)	Solid-earthed neutral system.	Abnormal current flow due to earth phase fault. Best suited to single-phase transformer units, but satisfactory with single and polyphase units. Interruption of service caused by phase short-current to earth.
(B.)	Isolated-neutral system.	Dangerous potentials on the accidentally earthed phase. Extension of the arc to sound phases. Fault current dependent upon position of the fault for this system. Dangerous potential to earth for phase-to-phase fault (to earth) compared with (A.1). Danger of phase-to-phase faults widely separated. The l.v. system is inherently helpless against the most prevailing excess potentials. Dangers from h.v.-l.v. crosses, transformer insulation breakdown, etc. Best suited to three-phase transformer operation. Inherently weaker and less protected than (A.1). Line conductor in danger of weakness and breakage. More than one interruption likely to occur, *i.e.*, (a) interruption of service to avoid conductor breakage or weakness; (b) interruption of service at a later date due to operating with intermittent arc at cracked line insulator.

The most prevalent troubles are from cracked or faulty line insulators; such failures most often occur at the most elevated points and/or the greatest mechanically stressed points of a line where conductor weakness or breakage is the most critical, and they may occur in industrial or populous areas where soot and dirt collect. Intermediate line voltages prevail in such areas, hence there is need for a device that will permit (for a time) satisfactory operation of a line and system during a phase fault to earth, for instance, during a dark night. For the higher voltage lines the device is required to permit satisfactory operation during a phase fault to earth, say, at some remote part of a long line serving an important load.

The inductive (reactive) protector used for this purpose can be so designed for the particular circuit or network that faults to earth are completely quenched, and under earthed-phase conditions the current in the winding may safely compensate for the whole or the greater part of the fault current to earth. Complete compensation requires that the current to earth should equal the compensating current in the winding, *i.e.*, the load arising from the fault to earth should be equivalent to the normal output or full-load rating of the protector for several hours' operation. This load is limited by the kVA capacity of the power transformers to which the protector is connected. Effective damping is influenced by the circuit conditions, such as line conductance, single or parallel circuit operation or lines, symmetry and variation of line voltage, and length and disposition of line conductors; and its use depends on the system connections.

Rural Electrification in France. By Theodore Rich

Success of Government's scheme for development

THE French Government when adopting a policy of encouraging the supply of electricity to the countryside to induce labour to remain on the land, decided that the proper department to handle the matter should be the one connected with agriculture, the members of which would be individuals who could think rurally. It was assumed that the main problem was distribution from the wholesale point to the village and farm and that, once the demand for power was established, organisations could be found without difficulty which would supply bulk power. Experience has shown that this policy has been quite sound.

The general control of electricity supply is under the Ministry of Public Works (by an Act of 1906), but in practically all matters of moment that Ministry has to consult the National Electrical Committee, a well-balanced voluntary body drawn from a number of official and business sources.

Well before the war a beginning had been made with rural electrification, starting mainly in water power districts and spreading widely; during the war progress was held up, but in 1919 there were 7,500 urban and rural communes with an electricity supply. Before the war rural distribution was carried out in a few districts by agricultural co-operative societies which purchased power in bulk and obtained the technical aid of the engineers of the power companies concerned. It was realised that if rural small unit autonomy was to be continued —and the Frenchman is very jealous of any interference with the rights of local self-government—some form of assistance must be given by which small communities could get expert engineering advice, without having to pay consultants' fees beyond their means.

The Government's Policy

A Department of Rural Engineers was formed, the engineers of which have been first educated as agriculturists with an engineering training tacked on later. By this means any tendency towards extravagance is curbed, and those in executive positions start off with some knowledge of what people in rural areas actually want.

When the Government decided to push rural electrification with the aid of loans and grants, it handed over the local control of the business and technical side to the rural engineers to act as both general advisers and watchdogs to see that the State got value for its money and risks.

Starting in 1919 under a series of legislative measures a rural electrification policy has been gradually developed. A report recently issued by the Water Supply and Rural Engineers' Department of the French Ministry of Agriculture shows that in 1927, 18,210 communes were supplied with electricity and by 1932 nearly 32,000, or 83 per cent. of the total number, at any rate around the village centres. Up to date 25,000 rural communes have received benefits or are in the course of receiving aid from the Ministry of Agriculture, and if one deducts, say, 15 per cent. as the proportion of scattered rural inhabitants outside the radius of distribution, then it can be said that thirteen million inhabitants have had electricity brought to their doors, thanks largely to the policy of the Government. Only 2 per cent. of the communes of the whole country have not yet taken advantage of the national scheme.

L.p. line on light concrete posts, with twin post in foreground to take angle strain

The Government has put up money in two forms: (1) On loan at a low rate of interest plus a sinking fund charge; and (2) on direct money grants, termed "fonds perdus" (lost funds). From the very first the Government has realised that the capital cost of supply in a rural area must be influenced to a very large extent by the density of population, and the percentage of the total capital cost that it will put up, in one form or the other, varies inversely with this density.

The communes have been encouraged to get together for the handling of specific duties only and to form "syndicats" (associations of communes) especially for the supply of electricity. The commune does not lose its individuality, its interests are not overruled by richer areas, and there is not the same feeling of patronage that exists in those countries where municipal bodies extend their areas of electricity supply outside their boundaries.

L.p. overhead lines for supply of farms

A Serious Problem

A difficulty is that in the areas under the Government scheme there are only about fifty-eight inhabitants per mile of line (high- and low-voltage combined), and 165 inhabitants per transformer station. The latter is lower than in some countries owing to the general use of 110-volts; there are nineteen inhabitants per kVA installed. This does not mean that as many as thirty-six inhabitants are reached per mile; in some districts the figure falls to twenty, as in the south-central plateau round Auvergne. The h.v. lines average 42.5 per cent. of the total (varying from 20 per cent. to 75 per cent.); there are 2.85 miles of combined line per transformer station, and 0.31 mile of line per transformer kVA, the average output per station being 8.5 kVA. In some parts, especially where supplies are given at about 3,000 V, the departmental average is smaller, whereas in some districts it averages 20 kVA. The figures vary in different departments not only with the population density but also with the dates when the installations were put in and the existence of local industries. The geographical variations are remarkable, showing that for large transformers a wide belt stretches from Brittany round the north, going east and down to the Mediterranean, where the kVA per inhabitant is highest.

In the north-east and south-east there are over twenty consumers in every 100 inhabitants, in the centre and south-west fifteen to twenty, and in the west and north-west about fifteen, where the installation is more recent. There are in some rural districts one to two motors per 100 inhabitants for the communes with an electricity supply, two to four in the north, and over seven in a district in the Vosges. The energy consumption per inhabitant ranges from below 10 kWh up to over 40 kWh, especially in some Alpine regions. In addition to the creation of new electrification areas, much has been done to extend services over a larger proportion of each area.

In the matter of the Government grants without interest

forty-three departments have not participated, although some of these communes have received aid from what we should term the County Councils.

In a number of cases industrial concessionnaires have put up money to aid rural electrification. Of the total put up about 63 per cent. has been found from Government, departmental, communal and other grants, and the balance in various forms of loan. When a commune wants a supply under the scheme, the rural engineers are called in; they report on it and if sanctioned they certify payments as the work progresses, the total paid out being limited by the amount voted in the annual budget.

Of the communes electrified 9 per cent. are operated locally by departments, groups of communes, or isolated communes. The balance is operated under concessions of various types; in 1,169 communes the supply is given by Agricultural Co-operative Societies, the remainder being under private enterprise. A responsible engineer of the French Ministry of Agriculture has stated that money put up as so-called "lost funds" is giving a good return from the revenue from business created or preserved; in other words the scheme is genuinely reproductive.

The cost of rural electrification in each department varies to a material extent with the amount of earlier development. In a certain number of areas in some departments, where the conditions are peculiarly difficult, expenditure has had to be delayed. When rural electrification was started a strict limit was put on the amount of money which could be granted per inhabitant served. The first areas to be electrified were naturally those most densely peopled.

The money put up by the Government in different forms amounts to about 42 per cent. of the cost of the work; it is calculated that up to the end of last year the total Government sum granted will have reached 2,000 million francs or £15 millions at par.

Local Self-help

France is a country with widely divergent natural influences, from the fog and rain of the Somme to the semi-tropical Mediterranean, and from the Devonshire-like coasts of Brittany to the summit of Mont Blanc. The Government therefore has given the widest possible latitude regarding the way in which rural electrification can be carried out while retaining control over the expenditure. The principle has been adopted as far as possible that a very appreciable proportion of the funds must be found in the area concerned. A local body may make arrangements to distribute electricity to its inhabitants or it may hand over the duty to an existing power company, which is thus encouraged to extend its area of supply; there is nothing to prevent the handing over of national plus local funds to a company, which is done in one large area in the north, where the company makes a charge of so much per consumer's meter (depending on the size) per month or per quarter to cover local and other interest charges.

The retaining of the autonomy of the communes encourages the principle that the local standing charges for the cost of installation shall be borne by the consumers themselves. Where companies are concerned the relationships of concessionnaire and communes are framed so as to give both parties an interest in the prosperity of the undertaking, and although France in label is much more socialistic than we are, yet in many little things there is not the same antagonism between local bodies and public utility undertakings which at home has in the past held back electricity in so many parts.

Local Interest in Schemes

In some cases the County Council buys bulk power and handles the high-voltage transmission up to the group transformer station, making a charge for its services, and a commune or group of communes distributes and in turn covers its charges. Local loans of responsible communes and groups of communes are issued, every effort being made to raise money in the locality, the people therefore look upon the undertaking as their "own show."

Under a post-war Act where a locality takes a financial interest in rural electricity the settlement of wayleave matters is greatly simplified. No man is more jealous of the rights of a proprietor of the soil than is the small French agriculturist, but he comes quickly to reason when he realises that if unnecessary trouble and consequent expense are caused he and his neighbours have to help "stand the racket."

While the French have made great efforts to bring electricity to the doors of a very high proportion of the rural population, they have done it at a very low relative cost. Up-to-date lighting has predominated, the giving of good light to the peasant being one of the principal objects of the original scheme, and the load has not grown nearly as fast as in such rural areas as are supplied in Britain.

When the system was first developed some of the h.v. rural lines were very light in section; they were termed by some "ficelles sur pôtaux" (strings on posts), but they have shown the way, and later lines have conductors of larger section, giving also greater mechanical security. The agricultural crisis which affects the whole world has held back the purchase and use of electrically driven appliances to a certain extent.

Turbine Efficiency. By Sydney D. Scorer, M.I.Mar.E.

The part played by leaving and exhaust losses

THE thermal efficiency of a steam turbine may be increased by raising the initial pressure and temperature of the steam or by lowering the final exhaust pressure and temperature at the condenser. In either or both methods the available heat drop through the turbine is increased, but the extent to which higher initial and lower final temperatures are justified depends on the relation between the extra capital cost and the probable savings obtained during service conditions.

The efficiency of a steam turbine is directly related to the amount of heat which it converts into useful work compared with the total quantity of heat available. It is a function of the number of stages, or subdivisions of the total heat drop, provided throughout the length of the machine, and in practice involves a compromise with the requirements of reasonable capital cost. The cost may be reduced by decreasing the number of stages and increasing the steam and blade velocities, but when the steam is rushed through the machine a large amount of useful kinetic energy is carried over to the condenser. This leaving loss at the last row of the low-pressure blades depends on the area allowed for the passage of steam through the blading; the leaving area provided for given steam conditions is one of the principal factors limiting the output of a turbine of given size, and, consequently, cost. E special attention should be given to this point when considering the adoption of alternative designs.

Mr. Sydney D. Scorer

On leaving the last row of blades of a single-flow machine the absolute velocity of the steam is sensibly axial, and varies directly as the specific volume corresponding to the exhaust pressure, and inversely as the leaving area. When the velocity exceeds a certain value the kinetic energy which is thrown away to the condenser is large enough to affect seriously the overall efficiency of the turbine, so that there is a limiting figure above which it is not wise to go if the carry-over losses are to be kept below a maximum value of about two to three per cent. of the total available heat drop at the economical rating of the machine. For a given leaving area the carry-over losses increase with decreased back pressure, and a point may be reached where the extra heat drop due to higher vacuum may cancel out with the increased losses. The leaving area must therefore be proportioned with the exhaust conditions in mind.

Various Blade Forms

In modern steam turbine practice the problem has been solved by several methods. A large leaving area may be obtained by increasing the mean blade diameter and allowing extra blade length, but there is a limit to which this practice may be carried, as the resultant stress in the blade material varies directly as the diameter and as the square of the revolutions per minute.

Efforts have been made to minimise this by the adoption of various forms of tapered and twisted blades, &c., more or less successfully. An alternative method, which allows of reduced blade stresses and gives a larger leaving area, is to

Some Municipal Electrical Engineers

From left to right: **Mr. J. E. Shepherd, Rawtenstall; Mr. J. F. Simpson (*Lafayette*), Preston; Mr. A. H. Todd, Clitheroe; and Mr. C. Furness (*Elliott & Fry*), Blackpool.**

Turbine Efficiency *(concluded from opposite page)*

reduce the turbine revolutions per minute. Unfortunately, a fairly large drop in speed is necessary, and the resultant falling off in efficiency and increase in first cost does not always justify the reduction of leaving loss.

Designers of single-cylinder machines for limit outputs have adopted various types of improved low-pressure blading in order to cope with the huge steam volumes obtaining at the later stages. The Metro-Vickers multi-exhaust blading is one of the best known methods of providing adequate leaving area with a high factor of safety and reasonable cost. With this type of blading the output of a machine can, in special cases, be further increased by the use of a double-flow arrangement, a multi-exhaust being incorporated in each flow.

Another method of achieving the same object is used by the Brown-Boveri Co. in their single-cylinder turbines, a volume of steam being abstracted at a point immediately preceding the last row of guide blades, the steam being directly discharged into the condenser. These makers have found that the last row of moving blades works with a higher efficiency when the steam flow is reduced, and that the output is increased despite the amount drawn off. The quantity of water of condensation thus removed may have something to do with this result, as its retarding effect on the blade backs will be considerably diminished.

The Construction of Exhaust Casing

Intimately related to the question of carry-over losses is that of exhaust loss. Unless the turbine exhausts directly into the condenser, a passage must be provided and the loss occurring at this point varies as the square of the steam velocity. The pressure drop between the last row of moving blades and the condenser may be minimised if some of this kinetic energy is converted into pressure energy, and this has resulted in the construction of exhaust casings in which the diffuser principle is utilised. The steam is led away from the blades by means of suitably shaped passages, the cross-sectional area of which increases gradually towards the condenser, and some of the leaving loss is applied to overcoming the frictional resistance, thus minimising the pressure drop. The guiding surfaces must be kept as small as possible and they should be well curved in order to maintain the losses at a low figure. Moreover, there should be no danger of turbulent flow due to crossing of the jet paths.

In the single-cylinder turbine the shape of the exhaust casing depends a great deal on the methods adopted in handling the steam at the last stages of the machine. When the ordinary or multi-exhaust design is used the exhaust steam passes directly through a diffuser-shaped passage into the condenser. There are other methods of reducing the leaving losses, as by the use of a double parallel flow at the low pressure stages. In this the steam flow is divided and passes through two sets of low-pressure stages, so that the exhaust passage to the condenser is somewhat complicated and must result in higher exhaust loss.

When the provision for reasonable leaving losses with the single-cylinder construction results in a large increase in complication and cost, the best solution is to adopt a two-cylinder unit. The difficulties due to the use of high pressure and temperature steam are thus confined to the high-pressure cylinder, and the low-pressure section may be designed with reasonable values of the leaving and exhaust losses.

Here again, for limit outputs, the question of leaving loss arises; the adoption of a double-flow construction approximately halves the leaving velocity, and, consequently, reduces the leaving loss to one quarter of its value with a single-cylinder turbine. This method is used in impulse and reaction turbines, and some of the most recent and efficient machines are constructed on these lines. The 80,000-kW set built by the A.E.G. for Golpa-Zschornewitz has a double-flow low-pressure cylinder with steam entering at mid-length, whilst the largest turbo-generator set in the world—the 208,000-kW set at the State Line station on Lake Michigan—has two double-flow low-pressure cylinders, each cylinder being provided with four separate exhaust branches and condensers.

In recent British practice the number of cylinders and their arrangement varies somewhat, a three-cylinder set with a double-flow low-pressure cylinder being supplied for a power as low as 15,000 kW (the Richardsons, Westgarth-Brown Boveri machine at Southwick station, Brighton). A similar construction is used by the English Electric Co. for the Blackburn Meadows installation for 25,000 kW. On the other hand a 50,000-kW set supplied by the B.T.-H. Co. of Ironbridge has only two cylinders, the low-pressure one having a double flow, whilst a 50,000-kW turbo-alternator by the Parsons Co. in the Dunston 50-cycle station has two cylinders, but with a single-flow low-pressure unit.

Other things being equal, the provision or otherwise of suitable methods of minimising leaving and exhaust losses form a valuable basis of comparison, especially when maximum efficiency with moderate cost is desired.

The Diesel-electric "Rail-bus"

THE Diesel-electric "rail-bus" just built by Sir W. G. Armstrong, Whitworth & Co., Ltd., is to undergo trials on the Northumberland and Durham lines of the L. and N.E.R. It weighs 17¼ tons and is claimed to be the lightest 60-seat self-propelled coach for railway service yet made in Great Britain; its seating capacity is either fifty-seven or seventy-one, according to whether a luggage compartment is required. It is designed for frequent high-speed local and branch line working to compete with road services.

The 95-b.h.p. Armstrong-Saurer six-cylinder engine runs at 3,000 r.pm., or if of 140 b.h.p. at 1,500 r.p.m The use of the A.B.E. transmission system (manufactured to Armstrong Whitworth's design by Laurence, Scott & Electromotors, Ltd.) enables the advantages of a completely flexible and constant horsepower electric drive to be obtainable without sacrifice of lightness and without disproportionate increase in cost; the somewhat more efficient mechanical gear enables the best use to be made of the engine at its two or three fixed working speeds, but has only about half the life of electrical transmission. The starting motor and lighting dynamo are replaced by the A.B.E. generator, which is bolted to the crankcase; the final drive is by a tractor motor rigidly mounted in the underframe, carden shaft, and Craven-Guest worm drive.

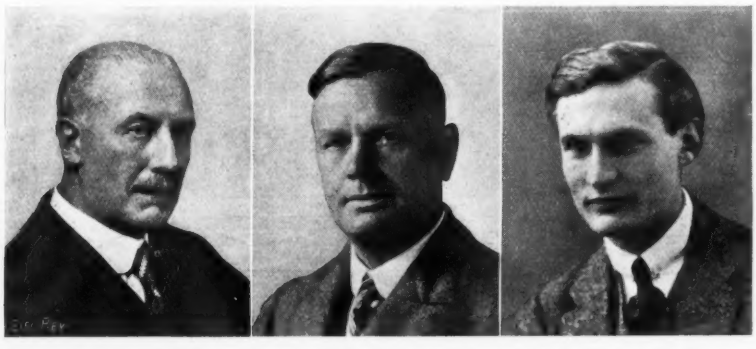
The control resembles that of a steam locomotive; three levers working in a slotted cover operate the throttle, the forward and reverse drum, and the engine "stop" and "start" switch, the apparatus being incorporated in one (instead of the usual two) sets situated near the engine and controlled by compensated steel-wire rope running on pulleys. Ferodo-lined expanding shoes work in brake drums mounted on the inside of the running wheels, the four brakes of each bogie being actuated by compressed air.

The length of the rail-bus body is 52 ft. 6 in. and the maximum width is 8 ft. 11¼ in., with a height above rail level of 11 ft. 11¼ in. The bogie wheelbase is 7 ft., the distance between bogie centres 30 ft., and the diameter of the wheels 2 ft. 9 in. Illustrations appear on page 943.

The World Power Conference

Sectional Meeting in Scandinavia

THE Sectional Meeting of the World Power Conference opened at Copenhagen on Monday last. The proceedings included an official dinner and, on the following morning, visits were paid to important industrial works and generating stations in the district. The delegates travelled by night to Stockholm, which they reached at noon on Wednesday. The afternoon saw the official inauguration of the Conference at the Concert Hall, Stockholm, in the presence of the Crown Prince of Sweden, the high patron, who had agreed to deliver the opening address.

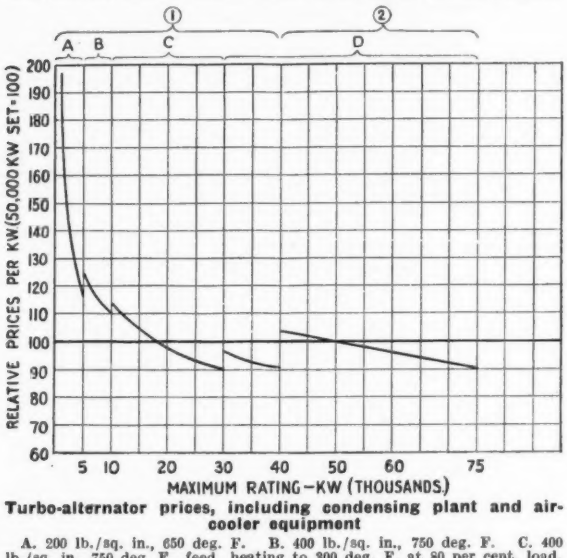


Messrs. C. D. Taite (*Lafayette*), **F. Forrest** (*Lafayette*), **and H. Hobson** (*Elliott & Fry*)

The technical sessions opened yesterday at the Houses of Parliament with the presentation of fifty-nine papers on Energy Supply in Large-scale Industry (Section 1) and Energy Problems of City and Suburban Traffic (Section 8). These were followed by discussions, some of which were available in advance in printed form.

An important paper presented by Messrs. H. Hobson, F. Forrest, and C. D. Taite was entitled "A Survey of Industrial Electric Power Supply in Great Britain." In this the authors state that the percentage of occupied population engaged in manufacturing industries and in commerce and transport in Great Britain is 73.5; the corresponding figures in Germany, the United States, and France are appreciably less, being 59.8, 56.2, and 46.8, respectively. The percentage distribution of the national income (£3,926 millions) is: production of raw material (excluding imports), 13.4; net output of industry, 41.5; distribution, 24.1; agricultural output, 4.5; services, 16.5. Power supply is therefore of predominant importance.

The parochial system and piecemeal development of public electricity supply at various frequencies and voltages have in the past led many manufacturers to establish private generating stations, the capital charges on which are a heavy burden when industrial output is low. The war made it clear that Britain suffered from a relative inadequacy and immobility of power resources. Labour-saving devices have been introduced more slowly in this country than elsewhere, and mass-production methods have not been applied so widely here as they have in such countries as the United States and Germany.

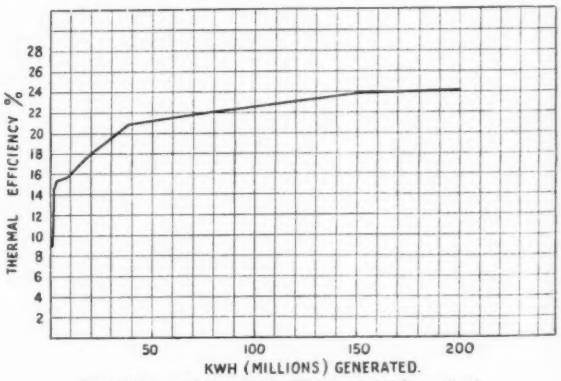


Turbo-alternator prices, including condensing plant and air-cooler equipment

A. 200 lb./sq. in., 650 deg. F. B. 400 lb./sq. in., 750 deg. F. C. 400 lb./sq. in., 750 deg. F., feed heating to 300 deg. F. at 80 per cent. load. D. 600 lb./sq. in., 800 deg. F., feed heating to 340 deg. F. at 80 per cent. load. 1=3,000 r.p.m.; 2=1,500 r.p.m.

Comparing the Census of Production records of Great Britain (1924) with those of the United States (1927) we find that the average equipment per worker here was 2.23 h.p. as against 4.6 h.p. in America. The complete British Census for 1930 is not yet available, but figures published up to November, 1932, covering industries employing two-thirds of the total h.p. recorded at the time (but excluding mining with 4.4 million h.p.) indicate that the h.p. per worker in Britain in those trades has advanced from 1.49 in 1907 and 2.52 in 1924 to 3.13 in 1930. In 1907 mechanical power used directly in the same industries represented 84 per cent. of the total, in 1924 46 per cent., and in 1930 34 per cent. There is still over three million h.p. of reciprocating engines in this two-thirds of the installed h.p. that awaits conversion. Of the 7,457,500 h.p. of electric motors, 34 per cent. are supplied from generators at works; the percentage for the same trades in 1907 was 57.5. In 1907 only 7 per cent. of the total power equipment of the group was energised from the public mains; in 1920 the figure was 43 per cent.

The most important reasons for the increase in energy purchased from the public mains are given as: (1) Lower capital cost per kW for the larger plant installed by public supply undertakings; (2) The raising of capital by company or municipal undertakings at interest rates approaching those applicable to Government long-date loans. Most potential power consumers must debit the cost of privately produced power with interest on generating plant calculated at a rate commensurate with that earned by capital invested in the business. A higher rate of depreciation, also, must be allowed for private plants, owing to the greater facilities for expert maintenance in the public supply undertaking, and owing to continued growth of the latter, which enables it to use its older plant for peak load, whereas private plant must throughout its life deal with the whole requirements of the factory. Broadly, these two factors represent a difference of from 4 to 5 per cent. per annum on the capital expenditure.



Variations of thermal efficiency with output

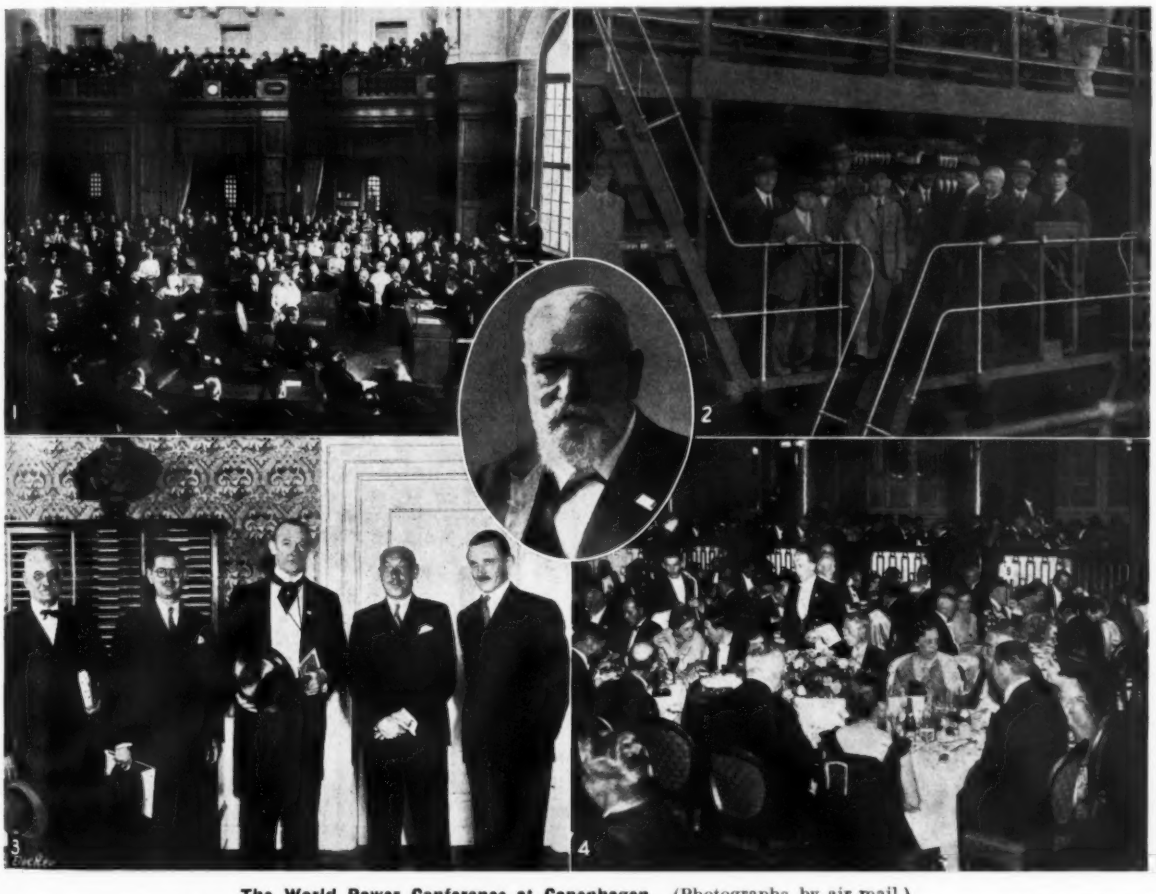
(3) The improved thermal efficiencies obtained in large power stations under specialist supervision. (4) Greater security due to the installation of adequate reserve capacity, which it is not always economically possible to provide with private plants. In large factories supplies can be given from two or more sub-stations fed independently from the public system. (5) The diversity of demands upon a public supply system, coupled with a natural growth of output, prevents their being subject to the same fluctuations of load as private plants. Private plants, installed to meet the demand required for the full output of the works, are called upon to work uneconomically far below capacity during times of trade depression.

(6) Extensions to power-using processes can be made at will with payment for the exact amount of additional power needed; extensions of private plant must be made in units of reasonable size and cannot be accurately proportioned to the power requirements at all times. (7) The diversity between times of maximum demand of different classes of consumers permits a smaller capacity of plant to be installed in public generating stations to meet the aggregate load. The capital investment is therefore lower than if each consumer provided for his own requirements; other fixed costs, *e.g.*, wages and maintenance, are also reduced.

(8) Advantage can be taken of every advance in technical design, as new plant is being continually installed and used to deal with the base load, whereas private plants tend to lose their efficiency with age. The steadily increasing economy of public generation is illustrated by the drop in fuel consumption of all public generating stations from 2.78 lb. of coal per kWh generated in 1922 to 1.82 lb. in 1931. The average price of coal is 77.1 per cent. of what it was in 1922, but the price per kWh of electric power is only 62.3 per cent.

The grid will not only accelerate the operation of the various influences making for economy but will introduce new and vital factors in the economics of power supply. These factors are: (a) Concentration of generation in a limited number of efficient interconnected stations will cause a rapid increase in thermal efficiency of generation and in the more economic employment of capital and labour. Economy of fuel will also result through the relegation of the less efficient stations to deal with short-hour peak loads. In 1931 the average fuel consumption at stations to be closed down was 2.19 lb. per kWh; at selected stations with an output exceeding 100 million kWh per annum it was 1.54 lb. The best figure was 1.2 lb., which should not be substantially exceeded by the average with the extension and greater use of the best stations. (b) The reduction of reserve capacity from 45 per cent. of the total plant installed in public stations to 15 per cent. where the system of the Central Electricity Board is in full operation will liberate plant for productive use. Had the grid been in existence prior to 1930/31 the total investment in public supply generating stations would have been some £42 million less; the saving in interest and depreciation would have been from 50 to 60 per cent. more than the whole of the annual charges on the grid. (c) Diversity between the demands of different supply authorities will reduce the aggregate demand on the grid below the sum of their individual demands, thus reducing the investment in generating plant. (d) Interconnection of generating stations will improve reliability, as shortage of plant at one station can be met automatically from others. (e) Industrial supplies will be available in the less populous districts at rates not widely differing from those in urban centres; this should assist the policy of decentralisation of industry.

The gradual obsolescence of private industrial plants tends to bring about their replacement by the public supply in course of time, but reliance on obsolescence will not effect the rapid expansion of public supply that will result in lower prices. One method that is receiving increasing attention is for the supply authority to take over the responsibility for the operation of the private plant during the remainder of its useful life, refunding to its owner such annual sums as will pay off the debt outstanding on the plant. The private plant can then be closed down or it can be run in parallel on peak loads, the main supply being given at low off-peak rates. Recent investigations have shown that industries requiring process steam as well as power can be supplied from the public mains at competitive rates (particularly if the load factor is good) unless the ratio of steam to power requirements is abnormally high. The capital investment for back-pressure or pass-out turbines is usually heavy, the control mechanism is complex, and the demands for steam and electricity frequently do not coincide. In industries which produce waste heat or gas as a by-product, it is often more economical to reorganise the process so as to eliminate waste heat rather than to utilise it for power production



The World Power Conference at Copenhagen. (Photographs by air mail.)
1. The opening session—Mr. D. N. Dunlop speaking. 2. Delegates at the H.C. Oersted power station. 3. Some of the British representatives (Messrs. F. Samuelson, B.T.-H. Co.; G. Summers, Stirling Boiler Co.; Alan Chorlton, C.B.E., M.P., president Inst. Mech. Engineers and leader of the British delegation; H. Jones; and P. B. Silk (The Ash Co.). 4. The official banquet on Monday evening. Inset: The President, Dr. Oscar von Miller

Points from Other Papers

Among other papers presented yesterday before Section 1 was one by T. N. Schulz (director, Watercourse and Electricity Service of Norway) on the utilisation of electrical energy in Norwegian industry (No. 114). The author points out that large-scale industry began in Norway thirty years ago when electrotechnical science made possible the use of part of the 10 million kW of water power resources available (chiefly in private stations) for the purposes of electro-metallurgy and electro-chemistry which now absorb 70 per cent. of the total output, wood pulp taking 11 per cent. At the end of 1931 the installed generator capacity was 1,759,000 kW to meet a demand of 1,060,000 kW, and 95 per cent. of the developed water power is now producing electricity; 6,190 million kWh was sent out in 1931, a reduction from 6,730 million in 1930 owing to a labour dispute.

In industry about 23,000 kWh (3.6 kW) per capita is consumed per worker; the power required is as high as 70 kW per worker in nitrogen production. Based on annual expenses of 10 per cent. of the capital value, the cost of production

of electricity is about Kr. 35 per kW or 0.45 ore per kWh.

The cost of meeting amortisation and maintenance charges on water-power stations when closed down is given by Mr. E. Svanoe (No. 82) at about half the cost of running at 100 per cent. load factor. He states that surplus power can be delivered at works adjoining the power station at 0.05d. per kWh (d.c. or a.c.). The production of iron direct from the ore is now being planned.

In Germany, Mr. G. Warrelmann states (No. 22) that endeavours to reduce manufacturing costs have taken the form of extensive application of power-driven machinery and the grouping of enterprises. The increased consumption of electricity for power due to the first has greatly exceeded that saved by the other, but in heating savings have more than balanced growth of consumption. In 1929 the total consumption of electricity was 23,000 million kWh, or two-thirds of the total power requirements, including mechanical transmission.

The consumption of power and heat in various industries is dealt with at some length. The amount of energy produced by private plants is decreasing in favour of that purchased from the public mains (in 1929 it was 53.6 per cent.), as it is found that the economic superiority of large central stations is not eliminated by transmission costs. The exception is when blast furnace gas is available for power production as heating (even including that of adjoining coke ovens) does not require all the gas available.

Mr. W. Martini (No. 4) shows that blast furnace plants, usually linked up with mining plants, have their own cable networks, but while he considers that extension of the power plants to deal with the total demand would be a good thing, he points out that the capital required could be better invested in manufacturing processes.

Co-operation of Large and Small Plants

There is a tendency in Germany, M. Gercke reports (No. 12), towards co-operation between the large public supply plants and the private and local stations. The former deal with the base load and the latter with peaks, emergencies, and traffic congestion on electric railways. Industrial power plants running in parallel with public supply stations are expected to keep an agreed demand very closely.

When regulation by hand or ordinary automatic regulators is inadequate, W. Kieser (No. 57) says that control by steam governors is adopted; these keep the frequency within ±0.05 cycles per sec. Isodromic governors are particularly suitable for the purpose. The voltage and wattless current in an isolated industrial plant can be kept constant by automatic voltage regulators fitted to all alternators working in parallel. Stability is achieved by utilising the compensating wattless currents between the alternators without special connections.

In a paper (No. 20) on the electro-chemical industry in Holland, Professor H. Gelissen draws the conclusion that there is still considerable scope in this direction. He surveys the quantities of fuel available in Holland, also the hydro-electric energy that could be produced in the future.

J. E. Borresen's contribution (No. 108) is in the form of a simple statement of the principles underlying the framing of tariffs. He shows that the output of private plants in Denmark is about 60 per cent. of that of the public undertakings, and suggests that the output of the latter is capable of being doubled. According to R. Balmer (Switzerland, No. 23) the best method of dealing with base loads, where water power is available, is usually by low-head run-of-river plants. For the bulk of the variable part of the daily load high-head turbines with water storage are most suitable, but for substantial peaks Diesel stations provide the most economical solution.

The problems involved in the supply of power to the Riga Cement Works are covered by G. Möller and E. Pirang. The decision to close down the factory's own station in favour of public supply was based mainly on the need to obtain economically a maximum adaptability to varying consumption and to provide for extensions. During the peak load of the public supply system, the maximum demand of the works is at a minimum.

Electric Steam Boilers

Secondary water power (*i.e.*, power that is available for only a portion of the time) is used in Canada (J. Morse and F. T. Kaelin, No. 80) for raising process steam by electricity for paper mills, &c. The cost of the electrode boilers, installed complete, varies from $1.3 to $3 per kW between 35,000 and 5,000 kW; they have been developed in capacities up to 50,000 kW at 22 kV. The use of water containing a low concentration of conducting salts obviates the need to blow down heavily; at a ratio of concentration of 15 the water blown down is about 6.6 per cent. to remove mineral salts, and heat losses are about 2 per cent. At the end of 1932 there were in Canada 131 units with an aggregate capacity of 1,243,850 kW.

About four tons of ore are required to produce a ton of aluminium with a consumption of 20,000 kWh. The production of aluminium is therefore as closely related to power as it is to its ore. T. J. Borstwick (U.S.A., No. 85) works out the effect of the cost of transmitting a.c. and d.c. from the water power station to the reduction works. The economic distance of d.c. is only three-quarters of a mile with energy at the turbine shaft at 0.4 per cent. kWh. At the same price the cost of a.c. at 100 miles (including conversion to d.c.) is increased by over 25 per cent.

Before Section 8 (City and Suburban Traffic) H. Samuelsen (No. 113) gave a short survey of the development of the tramway and omnibus services in Oslo. The total cost per seat per mile is lower for the trams than for the petrol buses, although the trams were operated by two men and the buses with one, and were partly of an old type whereas the buses are of recent construction. That the electric tramway will always be the most economical method of transport for dense traffic is the conclusion drawn by M. van Ameringen, who reviews the present trends in Germany (No. 116). He believes that in medium-sized towns the trolley bus will provide a good substitute for the tramcar.

South Africa House

AS in all modern buildings, the new South Africa House, Trafalgar Square, London, has a good deal of electrical equipment. A supply of electricity is received from the Charing Cross Electricity Supply Co., Ltd., 11,000-V feeders being brought into a transformer sub-station situated in the sub-basement of the building. The energy is transformed down and three 400-V mains are run to a back-to-back type of ironclad main switchboard which is divided into three sections: Power, 400 V, three-phase; lighting, 230 V; and heating and small power, 230 V.

The total power load is 215 h.p., made up of one goods and two passenger lifts installed by Messrs. Waygood-Otis, Ltd.; motors for air conditioning, ventilating and heating plant, by Messrs. G. N. Haden & Sons, Ltd.; and other equipment including two deep well pumps and sewerage ejecting plant.

There are about 1,000 lighting points, including emergency and plug points. The wiring is drawn into copper conduits and gunmetal outlet boxes, and totally enclosed unit type fittings are adopted for general office use. Special architectural fittings designed to harmonise with the style of the building have been installed in the more important offices and public spaces. Emergency lighting is installed in the cinema, which is fully equipped with sound-film apparatus; the emergency lights are served by the Charing Cross Electricity Supply Co.'s theatre main. The wiring for desk lighting is in a chase which extends all round the rooms and is accessible by means of a removable skirting and also in the larger rooms by means of special floor outlet boxes. Plug points have been installed for external floodlighting equipment.

A number of 3-kW plug points is provided in the principal rooms, and there are plug points for vacuum cleaners in suitable positions on all floors. Bells have been installed throughout for inter-departmental use, incorporating luminous indicators for desks. Approximately 100 slave clocks are installed throughout the building, controlled by a master clock. All offices are equipped with G.P.O. telephones which serve for internal and external communication. Wiring for these is carried out in conduit.

The architects of the building were Sir Herbert Baker and Mr. A. T. Scott, and the consulting engineer Dr. Oscar Faber, O.B.E., M.Inst.C.E. The electrical installation was carried out by Messrs. Drake & Gorham, Ltd.

Some illustrations of the lighting appear on page 944.

A Joint Authority's Engineer as Consultant

ON June 26th Sir E. Campbell asked the Minister of Transport whether he was aware that the chief engineer of the London and Home Counties Joint Electricity Authority had been retained by the Margate Corporation to advise it on the question of the charges made by the Isle of Thanet Electric Supply Co., Ltd., for electricity supplied in the borough: and whether it was with his sanction that a highly paid official of a joint electricity authority, whose expenses were defrayed in part by the authorised undertakers within the district of the joint authority, was to act in a professional capacity for other bodies in competition with the members of the Association of Consulting Engineers, who had to provide their own offices and staff.

Lieut.-Colonel Headlam said that the London and Home Counties Joint Electricity Authority was a statutory body and had a right to appoint its own officers and to decide on the terms and conditions of such appointments. No sanction on the Minister's part was required.

THE factory buildings at Witton, Birmingham, of Higgs Motors are situated on a 14-acre site, and a recent tour through the large iron foundry, extensive machine shop, winding department, test room, stores and other departments revealed a particularly good production layout, with many examples of the most up-to-date equipment. In the machine shop, for instance, we saw in operation some very fine multiple milling machines turning and keying, &c., the various interior faces on frame castings. A.c. and d.c. motors from ¼ to 50 h.p. are produced, and 95 per cent. of the average product is actually manufactured on the premises.

We heard something of the most recent of the company's introductions, the first of its kind in this country, it was said, namely, special "stunning" equipment for the slaughter house. It embodies a motor alternator and special tong "electrodes" which are applied to the backs of the animals' ears. But apart from this, the latest developments are fractional h.p. motors, polishing machines and repulsion-induction motors.

There are three types of fractional h.p. machines: type D.H., a split-phase equipment following the firm's general construction for standard industrial motors, and having an automatic centrifugal switch which cuts out the starting winding at a predetermined speed; type DS, a repulsion-start induction equipment which is reversible by a simple movement of the brush rocker and has its short-circuiting gear totally enclosed; and type DW, a shunt wound machine.

Two methods of construction play an important part in reducing the overall diameter of the motor to the smallest possible limit. In one, applied generally to the smaller motors, the laminations form the actual casing and are clamped together by rings and rivets. The feet are carried by the end covers. The other construction employs a drawn steel shell into which the laminations are forced, and a separate fixing base which is dowelled to the shell. In this way manufacturing modifications become much less important. It is believed that this is the only instance of construction of this kind in this country.

A view of the extensive assembling shop

Special Designs for Polishing

Polishing machines for d.c. and single- and three-phase a.c. are made in two- and four-bearing types, the former being suitable for light work and for applications where a short space only between polishing and grinding centres is required, while the latter is intended for heavier work and for purposes where a greater distance is required between centres. It has removable taper-screwed false noses which can also be fitted to the two-bearing machine at extra cost. An optional pedestal with a suitable starter mounted on it gives a self-contained and very compact machine. The single-phase machines are each fitted with an internal centrifugal switch, so that they can be direct started.

We saw no fabrication work in respect of actual motor bodies, and we were told that the advantages which this might normally offer by way of reduced dimensions and smaller weight can be met by employing steel bodies.

A comparison between some of the smaller polishing machines (fractional h.p.) and motors of equivalent size of the special constructions referred to gave particular prominence to the advantages of these constructions. The polishing motors are necessarily enclosed and on this account castings are employed.

The company is very proud of its method of constructing rotors for squirrel-cage motors. Rectangular copper bars are inserted in semi-enclosed slots, and the ends are each twisted through 90 degrees so that they touch one another. They are then welded together, inside and out, to form a solid short-circuiting ring. We were told that this construction results in improved starting torque, and that there had not been one case of failure of these motors reported.

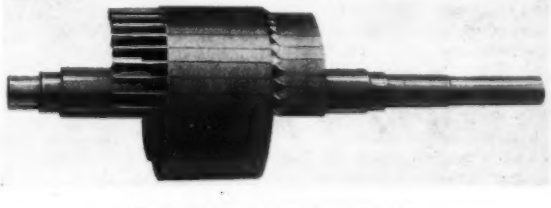
Fractional h.p. motor stator with drawn steel shell and fixing base

A representative of the company stated that the average size of the motors produced nowadays is gradually becoming less as the total output in h.p. is increasing. The figure now stands at 7.5 h.p.

Some idea of the extent of Messrs. Higgs's works may be gained from the illustration at the head of these notes. The interior view showing the assembly shop also gives an impression of vast size, coupled with a good layout and adequate lighting.

Filling Cable Boxes

IT is generally agreed that after filling a cable joint box with hot sealing compound several hours should be allowed for it to cool before the cable is made alive. It is, however, usual practice to fill low-voltage service boxes, up to, say, 460 V, while they are alive, the hot compound being poured on to the taped conductors. In order to amplify the knowledge of the risks taken, an investigation carried out by Dussek Bitumen & Taroleum, Ltd., showed that there is no serious objection to this being done. Variations in the ultimate results appear to be due to temperature and atmospheric conditions, not to the fact that the conductors are alive. The results are set out fully in the company's publication "ETD.3/33." The tests were made with an 11-kV trifurcating pole box, a 660-V four-way link disconnecting box, and a 440-V house service box, filled with "Trinidite," the characteristics and actual behaviour of which material are dealt with in publication "ETD.2/33."



Squirrel-cage rotor construction

The Clarence Dock Grid Connection

THE Clarence Dock power station is completely surrounded by the city of Liverpool and the River Mersey. Its position rendered the standard grid tower line connection impracticable. The only short and reasonably clear route was over the Leeds-Liverpool Canal, but even this abounded in clearance difficulties due to the height and proximity of the warehouses, bridges, chimney stacks, &c.

The double circuit line of six conductors and one earth wire is carried on steel gantries which straddle the canal. These gantries, which were illustrated on page 762 of the ELECTRICAL REVIEW of November 18th, consist of three horizontal girders each 8 ft. deep with a vertical spacing of 12 ft. The girder legs in the transverse view resemble the standard grid towers, but in the longitudinal view they are wedge shaped up to the level of the first girder, the sides then continuing parallel. The legs at the parallel portion are 8ft. wide on each face, but are tapered to a pin joint at ground level so as to provide clearance for towpath traffic and to enable them to be built in the confined spaces available. A standard width of 87 ft. has been adopted, the cross girders being divided into removable main panels of 8 and 11 ft., so that practically any width can be obtained by the addition or removal of standard parts. Variation in height has been provided for similarly, the standard height, 50 ft. to the bottom girder, being increased by the insertion of standard 5-ft. sections between the top of the tapered portion of the legs and the bottom girder. The standard height of 50 ft. gave an agreed clearance of 30 ft. above water level with a span of 700 ft.

The method of propping up the legs of a gantry during erection

The girder panel points were so arranged, in the plan view, that the incoming and outgoing spans of the conductors could be attached to adjacent panel points. This enabled the conductors to be side-stepped and facilitated the clearing of mid-span obstructions by keeping the conductors as nearly central over the waterway as possible. The gantries were designed to take, under normal conditions, the load due to the transverse wind on the structures and on the conductors (assumed to be coated with ice to a radial thickness of ½ in.) together with the component pull of the tension in the conductors due to the angle in the line. They were also designed to take the full longitudinal pull of the conductors, as these were not necessarily balanced as in the case of ordinary transmission towers on account of the torsion due to the provision for side-stepping at anchor points. The vertical loads were those of the ice-loaded conductors, the line fittings, and the weight of the structures; under these loads the gantries have a factor of safety of 2½ on the crippling load of struts and the elastic limit of tension members.

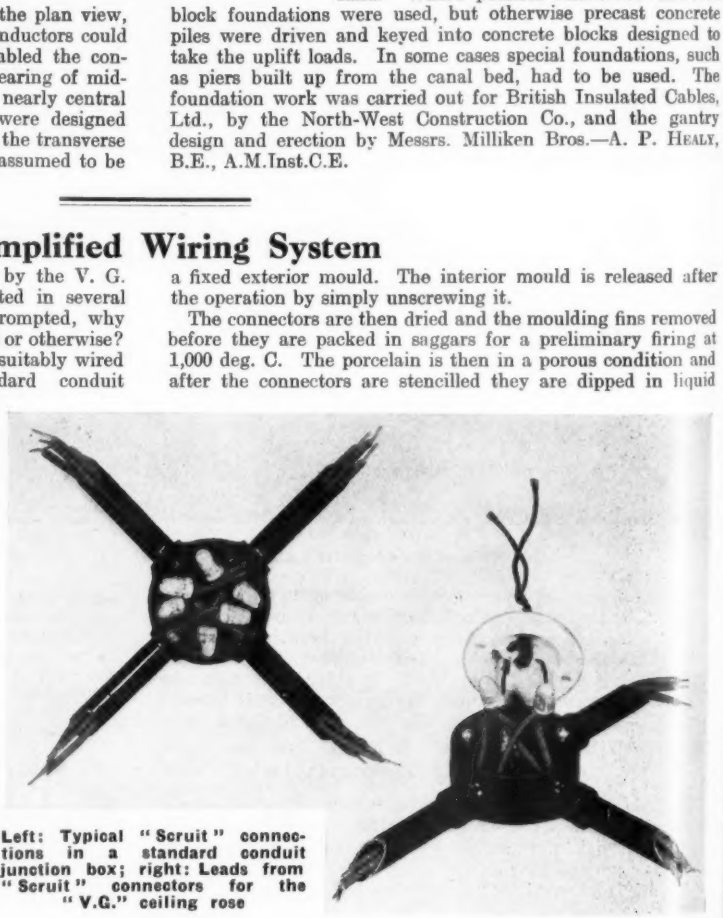
Under abnormal conditions, when the factor of safety was reduced to 1½, the loading covered the full unbalanced longitudinal pull of all the wires in one span in addition to the wind, transverse pulls due to angles in the line and the vertical loads. The assumption that all seven wires could be completely unbalanced at the same time was necessitated by the provision for stringing the conductors over the numerous power and tramway lines during short shut-downs. As each span was strung independently of the others each gantry must be capable of taking the full longitudinal load at least temporarily. To reduce side swing, tension insulators were used throughout, the live ends of the adjacent spans of the respective conductors being joined by rigid jumpers, rigidity being essential owing to the distance between the live ends, especially where side stepping was necessary.

Foundation borings were taken at the site of each structure; these disclosed many varieties of ground from rock to running sand. Where possible reinforced concrete block foundations were used, but otherwise precast concrete piles were driven and keyed into concrete blocks designed to take the uplift loads. In some cases special foundations, such as piers built up from the canal bed, had to be used. The foundation work was carried out for British Insulated Cables, Ltd., by the North-West Construction Co., and the gantry design and erection by Messrs. Milliken Bros.—A. P. HEALY, B.E., A.M.Inst.C.E.

A Simplified Wiring System

PORCELAIN "Scruit" connectors produced by the V. G. Manufacturing Co., Ltd., have been adopted in several surface wiring systems, and the question is prompted, why not use them in ordinary conduit systems, buried or otherwise? Our illustration showing six of these connectors suitably wired and neatly tucked into an ordinary standard conduit junction box is an adequate answer. But the use of the connectors is further supported by other considerations. A special ceiling rose developed by the company and employing the connectors, and designed for direct fixing to such junction boxes, forms an essential part of the wiring system and the step to similar applications for switches, &c., is a short one.

Further, the scheme supports the recent advocacy for a return to the "jointed" wiring system, with its consequent economies. All the wires may be pulled into position after the conduit system is installed, and the building is finished and no screws whatever are used in the whole of the wiring. But perfect continuity is maintained, the system resistance is not increased, and ample facilities for inspection of the installation are provided. The connectors are supplied in two sizes. The "Midget" will take the equivalent of one 1/.044 and two 3/.029 wires, and the "Normal" will take the equivalent of three 7/.029 wires. It is not necessary to twist the wires before fixing the connector, the application of which to the bunched conductor ends affords a well twisted and good electrical connection.



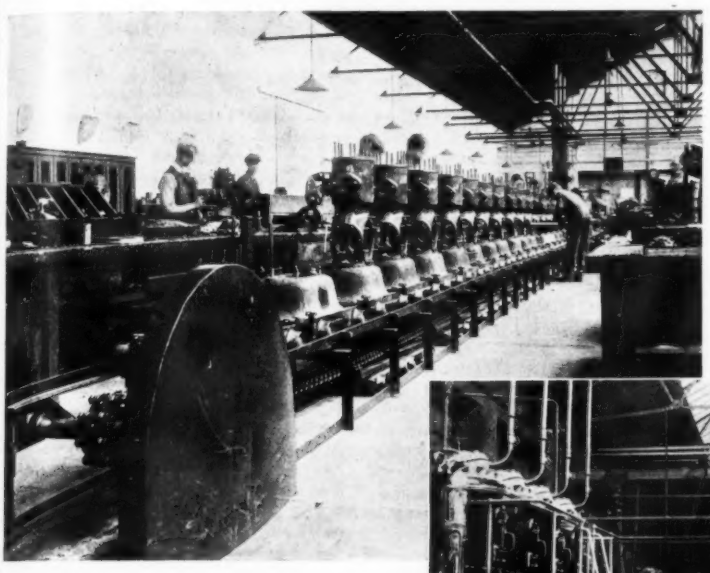
Left: Typical "Scruit" connections in a standard conduit junction box; right: Leads from "Scruit" connectors for the "V.G." ceiling rose

It is interesting to see these connectors being made. The raw material is a mixture of clays powdered after grinding and washing. This material is mixed with oil and water in machines like cake mixers till it becomes plastic, the resultant mixture passing through mincing machines. The required shapes are obtained on moulding machines in which a top interior mould with the thread is projected downwards into a fixed exterior mould. The interior mould is released after the operation by simply unscrewing it.

The connectors are then dried and the moulding fins removed before they are packed in saggars for a preliminary firing at 1,000 deg. C. The porcelain is then in a porous condition and after the connectors are stencilled they are dipped in liquid glaze and again fired, this time at 1,420 deg. C. Glazing is merely to improve the appearance and is applied to the exterior surface only of the connector; the second firing renders the porcelain absolutely dense and the glazing is not relied on to render the connectors non-hygroscopic. Firing is carried out in a kiln similarly constructed to those for the major firing in potteries, but it is oil fired with modern equipment.

Oil-engine Production

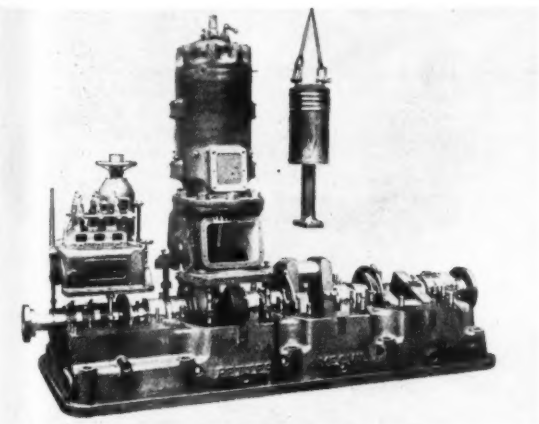
AT the oil-engine works at Yeovil of Petters, Ltd., broadly five ranges of engines of electrical interest are made: The "Atomic" Diesel engine in cylinder sizes of from 7 to 70 h.p.; a semi-Diesel set in models from 5 to 42 h.p., which is started "externally" by cartridge or compressed air; a high-speed compression-ignition set operating on crude oil and embodying separate scavenge pumps (24 to 44 h.p.);



A general view of the erection conveyor

small engines particularly suitable for house generating sets in 1½, 2, 3, and 5 h.p. sizes, designed mainly for paraffin running and petrol starting, with magneto ignition; and 2- or 4-h.p. air-cooled four-stroke Diesel engine sets having one or two cylinders respectively.

All except the last-mentioned group are two-stroke equipments. In the Diesel group up to six-cylinder sets are constructed, developing 400 h.p. at 300 r.p.m. To see the bed and crank case of a multi-cylinder set laid out with the crankshaft for receiving the further components is to appreciate the simplicity of having the fuel pump and all associated equipment at one end. The pump rotates in an oil-bath in the bed casting. The company's former practice of taking air in at both sides of the cylinder has been superseded by admission at one side only through a long pipe and non-return valves. This leads to considerably cheaper production and enhanced appearance.

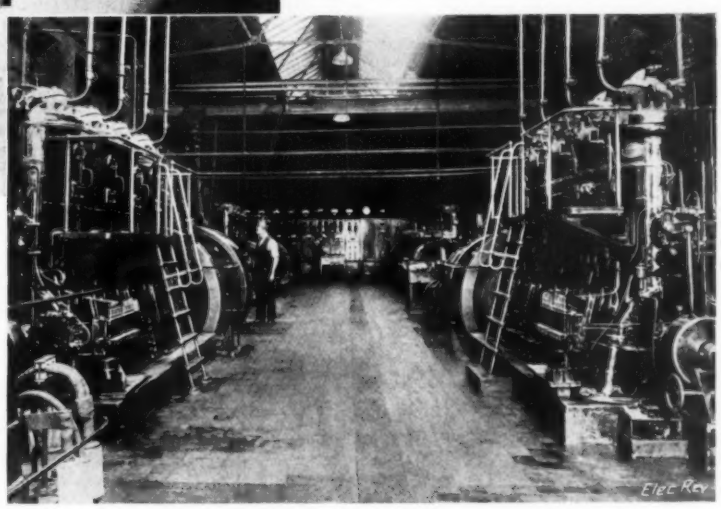


The construction of the multi-cylinder "Atomic" Diesel

Another departure from original methods is the production of the liner and cylinder in one piece. This is not only cheaper, but it also affords considerable advantages to the user. For instance, changing a liner, which normally requires highly skilled labour, is very simple, there being only one article to handle. Another advantage is that, in case of cooling-water failure, renewal of rubber rings is not involved. The universally cone-shaped piston tops and cylinder-head interiors and the H-section connecting rods are among other features which attracted our attention during a recent visit.

Fuel-oil admission is regulated by spill. On each cylinder exhaust pipe is an oil heater through which fuel passes from the gravity tanks on its way to the fuel pumps. The spilled oil is again passed through the exhaust heater. The fuel-pump shop affords some splendid examples of bench precision work. The atomiser spindle and sleeve engage with no tolerance, and final lapping of the sleeve is done by hand. The atomiser holes are drilled in small bench machines with hand-pressure control. The non-precision parts of the fuel-pump equipment are cadmium plated.

The main idea of the separate scavenging sets is the reduction of space or increased power and speed. A 60-h.p. engine (four cylinders) runs at 1,600 r.p.m., has a 4½-in. bore and a 5⅜-in. stroke, which may be considered against a 14-h.p. semi-Diesel set (single cylinder) running at 525 r.p.m. with a 6¾-in. bore and a 7¼-in. stroke. The separate scavenge-pump crankshaft is chain driven from the main crankshaft. We saw two of these engines under construction for the L.M.S. Railway.



The larger of the company's power stations

It interested us to learn that there is a considerable demand for the ordinary semi-Diesel engine for generator driving. It is a cheap and sturdy equipment. The single-cylinder model is started by hand, and the twin-cylinder equipment by compressed air.

With the universal four-stroke set it is possible to drive at full power from the half-speed (cam) shaft. Efficient cooling is provided by suction through flywheel vanes and delivery through guiding wings on to the cylinders. The half-speed shaft used to be driven through gears, but this was noisy, and the drive is now by roller chains. Replacement of one of the cylinders by a small generator results in a very neat and compact lighting set, which has proved very successful.

It was not surprising to find at Yeovil private generation by oil engines. There are two power stations with a total of 20,000 h.p. of equipment, mostly of the semi-Diesel type.

A Standard for Ebonite

THE third edition of the B.S. Specification for ebonite has recently become available, and shows some interesting changes as compared with the 1931 edition. The use of "accelerators" and loading materials is no longer prohibited, but excessive proportions of such substances are prevented indirectly by the electrical tests. Consequently, although the composition of the ebonite is no longer specified, compliance with the tests ensures that the material is substantially composed of good-quality raw rubber and sulphur. Some changes have been made in the permissible impurities, mechanical strength, and electric strength, while modifications have been introduced in the technique of certain of the tests, notably the electric strength and power-factor tests. Adjustments have also been made as regards the tolerances on dimensions.

Copies of this specification (No. 234-1933) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

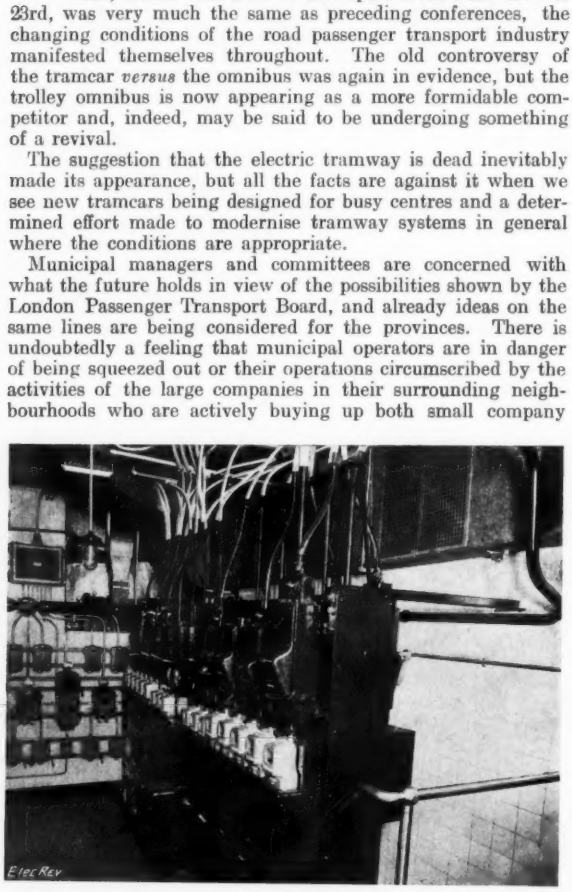
The Municipal Tramways Conference

The battle of the systems

ALTHOUGH outwardly the thirty-second annual convention of the Municipal Tramways and Transport Association, which was held in Blackpool from June 20th to 23rd, was very much the same as preceding conferences, the changing conditions of the road passenger transport industry manifested themselves throughout. The old controversy of the tramcar *versus* the omnibus was again in evidence, but the trolley omnibus is now appearing as a more formidable competitor and, indeed, may be said to be undergoing something of a revival.

The suggestion that the electric tramway is dead inevitably made its appearance, but all the facts are against it when we see new tramcars being designed for busy centres and a determined effort made to modernise tramway systems in general where the conditions are appropriate.

Municipal managers and committees are concerned with what the future holds in view of the possibilities shown by the London Passenger Transport Board, and already ideas on the same lines are being considered for the provinces. There is undoubtedly a feeling that municipal operators are in danger of being squeezed out or their operations circumscribed by the activities of the large companies in their surrounding neighbourhoods who are actively buying up both small company and municipal undertakings. Thus there is a disposition to urge the amalgamation of road passenger transport undertakings over large areas.



The switchgear at the new South Africa House

The Association was given a civic welcome on Wednesday morning, June 21st, by the Mayor of Blackpool (Alderman T. Fenton) at the Imperial Hydro Hotel, where all the functions in connection with the conference, except the Mayor's luncheon on June 22nd, were held. Following this Mr. C. Furness, borough electrical engineer and transport consultant, Blackpool, delivered his presidential address.

Before the annual general meeting was proceeded with, M. de Lancker (president, Union Internationale de Tramways) who attended the Conference with M. A. de Backer, the general secretary of the Union, conveyed the greetings of his Continental colleagues. He said that he hoped that British tramway managers would attend in large numbers the International Congress to be held in Berlin in 1934. If a sufficient number of British undertakings would join the International Union, the publication of the literature of the Union in English could easily be arranged.

The Annual Meeting

The annual general meeting was then held, the annual report and accounts being adopted. A vote of thanks was passed to Mr. L. E. Harvey (general manager, Ilford Corporation Tramways) for his services as chairman of the Joint Committee of the Association and the Tramways and Light Railways Association which for many years has dealt with problems concerning overhead equipment. Owing to the formation of the London Passenger Transport Board the Ilford undertaking ceases to exist on July 1st, and has resigned from the Association. The election of officers for the coming year resulted as follows: President: Mr. L. Mackinnon (general manager, Glasgow); vice-president: Mr. J. F. Cameron (general manager, Northampton); members of Council: Messrs. J. M. Calder (general manager, Reading), Owen Silvers (general manager, Wolverhampton), and F. A. Fitzpayne (general manager, Edinburgh); hon. treasurer: Mr. A. F. Fearnley (general manager, Sheffield); and hon. solicitor: Mr. F. H. C. Wiltshire (Birmingham).

Following the annual general meeting a private session was held when the position arising out of the formation of joint boards, such as the London Transport Board, was discussed.

In the afternoon of June 21st a paper was read on "The Growth of Passenger Traffic in Great Britain and some Features of its Regulation," by Sir Cyril Hurcomb, K.B.E., C.B., Permanent Secretary to the Ministry of Transport.

Mr. A. R. Fearnley opened the discussion, to which Mr. W. Vane Morland (Leeds), Ald. T. Woffenden (Huddersfield), Mr. J. Barnard (Bolton), and Mr. R. McCreary contributed.

At the annual dinner, which was held on Wednesday evening, Sir Cyril Hurcomb was the principal guest. Proposing the toast of "The Ministry of Transport," Councillor A. H. Gledhill (chairman, Halifax Corporation Transport Committee) said that if the Ministry of Transport were abolished it would be a very retrograde step. Something like £10,000,000 had been spent during the past few years to bring tramways up to date in various large towns. The number of passengers carried by tramways last year was 4,000,000,000. Sir Cyril Hurcomb replied and expressed the appreciation of the Ministry of Transport of the assistance so often afforded it by the Association. The Ministry was at all times only too anxious to do all in its power to make the tramcar and the trolley bus second to none in safety, comfort, and progressive design.

Mr. L. Mackinnon (president-elect) proposed "The Corporation of Blackpool," and Alderman T. G. Lumb (chairman, Blackpool Transport Committee) replied. The president, responding to the toast of "The Municipal Tramways and Transport Association," proposed by Councillor C. E. Tatham (vice-chairman, Blackpool Transport Committee), said that with the changes now taking place by way of Joint Boards and amalgamations, a wider constitution of the Association was receiving the close consideration of the council. Municipalities had invested some £80,000,000 in electric tramways and about £10,000,000 in railless trolley buses and motor buses, and every step must be taken to see that that capital was not allowed to decay. Therefore he urged municipalities to put aside the petty jealousies which had existed for too long and to pool their interests in a larger sphere of administration.

Transport Systems Compared

The conference was continued on Thursday morning, June 22nd, and, owing to the length of the discussion on the paper by Mr. C. R. Tattam (general manager, Bradford) on "The Three Forms of Road Passenger Transport, *viz.*, Tramways, Trolley Omnibuses and Motor Omnibuses: A Comparison and a Contrast," the afternoon also had to be devoted to it, although this was not the original intention.

Mr. C. I. Baker (general manager, Ashton-under-Lyne) contended that the trolley bus was definitely mechanically more reliable than either the petrol bus or the compression ignition bus, but Mr. John Cameron (general manager, Northampton) advocated the use of motor buses and regarded the compression ignition engine bus as a serious competitor of both the trolley bus and the petrol bus. Mr. R. S. Pilcher (general manager, Manchester) also maintained that the ideal vehicle for road passenger transport was the self-contained vehicle. Mr. A. C. Baker (general manager, Birmingham) and Mr. C. Clarke (general manager, Birkenhead) thought that the progressive transport manager should make use of all forms of transport according to the conditions in various districts of his area. Mr. Owen Silvers (general manager, Wolverhampton), who preferred trolley buses, said that during the past ten years these vehicles had run 17,000,000 miles in Wolverhampton and the oldest of them were in perfect mechanical condition. He could not say this of some motor buses he had purchased at the same time.

Mr. G. R. Steer (general manager, Brisbane City Council Tramways, Australia) said that he had been impressed with the improvements made in tramcars in this country, but at the same time there were a large number in use which were twenty or twenty-five years old. The new Blackpool car, however, indicated how the tramcar could be developed, although, of course, that particular design would be of no use in London or Leeds, for example.

Mr. J. Barnard (general manager, Bolton) urged that steps should be taken to secure a reduction of the charges for electricity for traction. Mr. W. Vane Morland (general manager, Leeds) suggested that any advantage which the compression ignition engine might have by way of taxation at present over trolley buses and tramways was not likely to escape the Chancellor of the Exchequer.

The Association was entertained at luncheon on Thursday, June 22nd, by the Mayor and Corporation of Blackpool.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

What is a Consultant?

I do not think anyone will disagree with the general conclusions which Mr. Dykes reaches in his letter published in your issue of June 9th, least of all the large manufacturing firms who have no desire to incur expense for which they are not paid, but nobody has I think put forward the reason for the present conditions.

The large manufacturers have in most cases research laboratories, and the development and growth of the industry is largely due to their efforts. Many consulting engineers do not seem to have realised that electrical engineering is to-day such a large subject that no one can be a specialist in all its branches. Even the main divisions, generation, distribution, illumination, heating, domestic appliances, traction, telephony, telegraphy, radio, &c., are subdivided by manufacturers into numerous groups with specialists for each. In consequence the average consulting engineer is not a specialist in many of the lines which he seeks to handle and either because he is not up to date or fears to show favour to a particular contractor prepares his specifications so that they can be filled by supplying circuits, types and patterns which were standard a few years ago or at least are not the latest or most economical. In other cases he specifies conditions which no equipment yet on the market will meet and either the order goes to a dishonest firm which does not point this out or fresh tenders have to be called for after the manufacturers have pointed out what would be reasonable.

It naturally follows that many clients wishing to have the latest developments go direct to one or other of the more progressive firms, and ask them to assist in preparing the specification. The manufacturer realises that only by this means can he get his latest developments brought into use and therefore undertakes the work for which he is not paid. Obviously his prospects of securing the order are enhanced by preparing the specification and therefore competition between manufacturers forces him to advertise that he will undertake such work.

Having outlined what is in my opinion the cause the remedy is obvious. Consulting engineers should notify the lines in which they are really specialists and confine their activities to these lines alone. They should keep in close touch with the manufacturers to learn their developments and make themselves fully conversant with the advantages and limitations of each new design, and not be afraid to word their specifications to secure only the equipment which they can conscientiously recommend as the latest and most efficient for the purpose, even if by so doing it restricts the competition to only one or two firms.

MANUFACTURERS' ENGINEER.

June 21st.

A New Manchester Club

It will be of interest to your readers to know that a club has been formed at the Athenæum, Manchester, for the purpose of providing facilities for the meeting together of persons in the electrical and associated trades and giving opportunity for closer personal acquaintance. The members meet officially every Friday for lunch and afterwards adjourn for social intercourse at which a discussion is inaugurated on trade subjects of general interest in which all present are invited to participate.

Application for membership or a request for further information may be addressed to me at the Athenæum Electrical Club, Manchester.

EDGAR GOLLAND, *Hon. Secretary.*

Manchester, *June 21st.*

What the Public Want

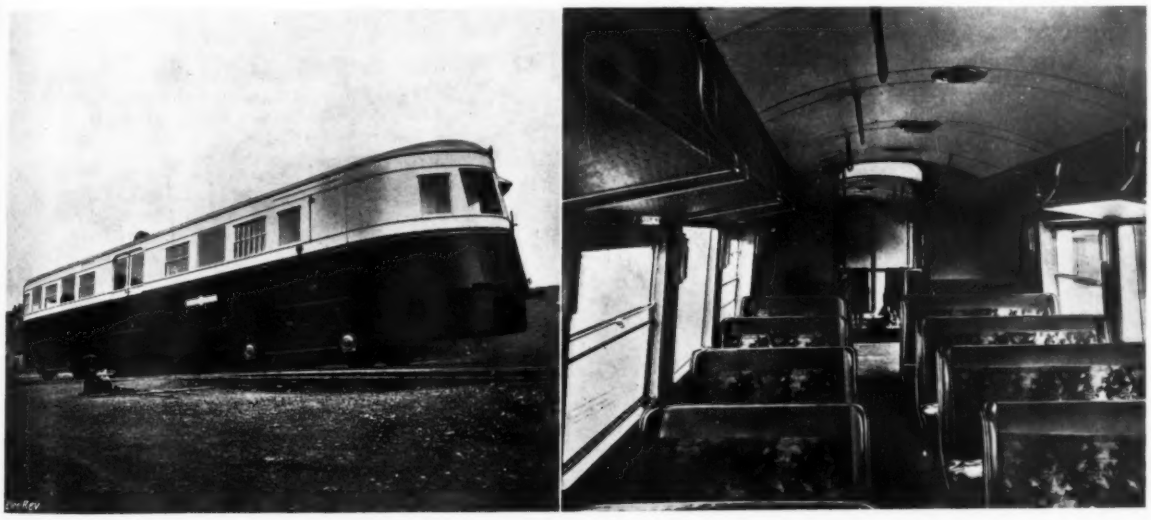
The letter in your issue of June 23rd from Mr. H. Wilson is very interesting; he certainly hits the "nail on the head," for the question of the future policy of the electrical industry is present in the minds of many, and the problem demands much careful thought.

Advertising certainly increases the purchasing power to a great extent, but the interest thus created is lost unless it is followed up by personal contact. This is especially necessary for the domestic side of electricity, and I venture to suggest that tremendous opportunities are lost through firms not attaching enough importance to the qualifications of those who act as intermediaries between themselves and the public. It is also a fact that, through the fear of being practically forced into buying something that they know little, or nothing, about, prospective customers will not enter an ordinary showroom. There are various ways of remedying this state of affairs.

The E.D.A. is launching an extensive advertising campaign, which, no doubt, many persons will see and read, but the question to ask is how many will become sufficiently interested to exchange their already installed gas ovens for an up-to-date electric cooker unless they can obtain really valuable and helpful advice as to the practicability of doing so? As a matter of interest, I collected the following information: Out of thirty-three houses where electric cookers are installed, eleven of them have small gas boiling rings for cooking bacon, boiling eggs, &c., and in several of the houses the occupants refused to make toast by the griller as they informed me that it took too long to get thoroughly heated. Surely these are instances where expert advice is needed!

(Mrs.) N. DYSON RAYNER,
Member of the E.A.W.

Prestwich, Manchester, *June 26th.*



Two views of the Armstrong-Whitworth Diesel-electric rail-bus described on page 935

Cable Jointing

I cannot agree with Mr. Simmons's remarks regarding wiped joints in his article published in your issue of June 16th. Porous joints are obvious to the practical eye immediately they are done, and it is not always bad solder or overheated solder that is to blame—too often it is unskilled application. Mr. Simmons suggests that jointers should reject overheated and porous solder for a better brand, but is it not wiser to teach the remedy, which all practical plumber-jointers know, that is, the correct addition and method of using phosphor tin?

Plumbing is an important part of cable jointing, but too little notice is taken of it, and too little knowledge is imparted to those operators who are merely automatons capable of one job, in one way only, and that very often a mere makeshift.

Brighton, *June 20th.* WILLIAM MASKERY.

Applications of Resonance

I would like to correct an error which appeared in my article under the above heading in your issue of June 23rd. The third paragraph included the following statement, " . . . as the applied voltage is raised and the resonant condition is approached the current increases slowly until at a critical voltage the point of resonance is reached. . . ." This is of course true only in the case of the particular type of non-linear series circuit referred to later in the article; the paragraph was intended, however, to apply to the more general case of voltage resonance and the word " frequency " should be substituted for " voltage " in the above statement.

In the first paragraph on page 897 the word " but " should be substituted for " also." G. W. PRESTON.

London, W.C., *June 26th.*

The Power Canvass

Mr. W. E. Swale in his article under the above title in the ELECTRICAL REVIEW of June 16th suggests that " members of electricity sales staffs should make the fullest use of the educational matter produced by E.D.A."

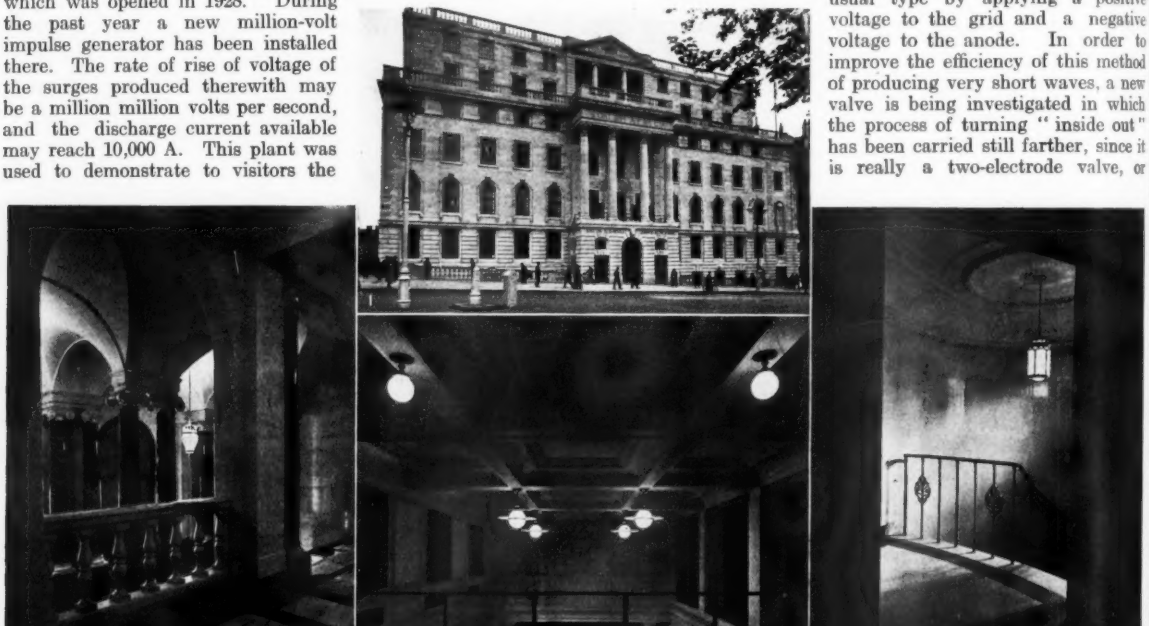
Is it not possible that some have not encountered this educational matter and are unacquainted with the source of supply? May we be enlightened, please?

Diss, *June 22nd.* LESLIE HOULDRIDGE.

The N.P.L. Revisited

THE annual inspection of the National Physical Laboratory, Teddington, by the general board took place on Tuesday, the visitors being received by Sir F. Gowland Hopkins, president of the Royal Society and chairman of the board; Lord Rayleigh, chairman of the executive committee; and Sir Joseph E. Petavel, the director of the laboratory.

The reception took place in the extra-high-voltage laboratory, which was opened in 1928. During the past year a new million-volt impulse generator has been installed there. The rate of rise of voltage of the surges produced therewith may be a million million volts per second, and the discharge current available may reach 10,000 A. This plant was used to demonstrate to visitors the effects of trees, buildings, &c., in attracting lightning discharges.



Lighting in South Africa House

1. The façade of the new building. 2. The main entrance vestibule. 3. The exhibition gallery. 4. A combined spotlight and pendant above a staircase.

In the electricity department a method has been developed to determine the time required for the eyes to recover their sensitivity after exposure to glare. This corresponds in practice to the case of a car driver who is unable to see for a certain period after meeting a car with high-power head lights. Another instance is afforded by an aeroplane pilot searching for an airway beacon, whose powers of vision are temporarily reduced by glancing at his instrument board.

When verifying the accuracy of domestic electricity meters it is usual to count the number of revolutions over a period of one or two minutes and to measure the time with a hand-operated stop-watch. An electric counting arrangement has been made to carry out both these operations automatically. The number of revolutions which it is desired to count is set on the dials. Then, by pressing a switch, an electric clock is started, and is stopped automatically when the desired number of revolutions has been completed. The arrangement is operated by a photo-electric cell, into which light is reflected once in each revolution from a small mirror attached to the rotating part of the meter. The apparatus could be adapted to other applications.

It is of the utmost importance that all materials used in the construction of coils for fundamental electrical standards shall be non-magnetic. Marble and fused quartz have been largely used for this purpose, but experiments show that both of these materials possess appreciable magnetic properties. They are both feebly repelled by a powerful magnet; in other words, they are diamagnetic. Some glass is also diamagnetic, but porcelain is slightly attracted, *i.e.*, it is paramagnetic.

In the radio department wavelengths of one metre or less can be produced in a cylindrical three-electrode valve of the usual type by applying a positive voltage to the grid and a negative voltage to the anode. In order to improve the efficiency of this method of producing very short waves, a new valve is being investigated in which the process of turning " inside out " has been carried still farther, since it is really a two-electrode valve, or diode, with its anode in the form of a metal rod down the centre, while a number of filaments are arranged around a cylindrical surface outside the central anode. The rod anode may conveniently be made part of a straight sending aerial which may be tuned by adjusting the length of that portion of it which is outside the valve. The valve is likely to have a considerably longer life than the ordinary triode, while other advantages are increased efficiency and flexibility in wavelength control.

The Engineering Department is collecting information regarding the behaviour of welds and welded metal under repeated loading stresses. To assist the application of electric welding to the joints in steel frame buildings and structures an extensive series of tests is in progress to determine, as far as possible, the reliability to be expected if electric welding were generally used for such constructional purposes instead of rivets.

The Metallurgy Department has found it necessary in studying the properties of metals above their melting point to determine the electrical resistance of molten metals over a range of temperature. The apparatus constructed for the purpose holds the metal in a vertical U-shaped channel in refractory material. Current and potential leads of graphite dip into the limbs of the U-tube, and the furnace is so arranged as to give a steady rate of heating or cooling during the taking of the measurements.

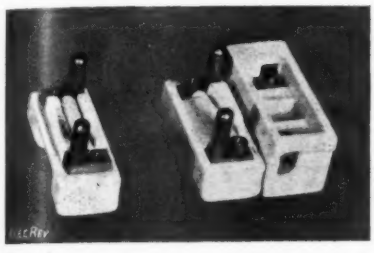
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Improved 5/15-A Fuse

The CASTLE FUSE AND ENGINEERING CO., LTD., Castle Works, 33, Chester Street, Liverpool, has notified us of an improvement in the "Triumph" 5/15-A fuse. The difference lies chiefly in the carrier, the fuse wire now being held under separate retaining nuts so that it is not necessary to disturb the plug contacts when rewiring the fuse.

In the case brass cheese-head screws with very thin heads are used. This has entailed a slight modification in the carrier, the brass blocks carrying the plugs being sunk further into the porcelain, and the plugs being lengthened. Slight modifications have also been carried out in the method of retaining the brass socket in the base.



An old and new "Triumph" fuse with socket

The new fuse is interchangeable with the old one, and costs 12s. per dozen with a base suitable for wiring both ends or busbar one end; with a base fitted with stems, nuts and washers for panel mounting the price is 18s. per dozen. In this type the stems are punched during the process of manufacture so that it is impossible for them to turn or unscrew once they have been assembled.

Bain-marie Cookers

Cooking equipment recently introduced by MESSRS. BAXTER & CAUNTER, LTD., Darnoc House, Alfred Place, W.C.1, and manufactured by the MANOR ELECTRIC OVEN & FIRE CO., 7, Sutton Street, Charing Cross Road, W.1, employs the bain-marie principle.

There are two equipments, the "Chef-Co" roaster and the "Chef-Co" bain-marie. A deeply welled and covered roasting pan is placed over a 600-W element horizontally disposed in a container measuring 17 in. by 11¼ in. by 11 in. high. With the roasting pan in position the heat is confined to the space between the case and the pan, for absorption by the latter. Three-heat switching is employed, and the price of the complete equipment is £3 5s.

The "Chef-Co" bain-marie type cooker, showing the method of employing it

The other outfit, in addition to the roasting feature, embodies a separate compartment for boiling and grilling, as well as a warming cupboard beneath the roaster. The same principle of "heating" is employed for the welled saucepans, and the 1,400-W elements are three-heat controlled. A deflector plate is used for directing more heat for grilling when boiling is not in operation.

The overall dimensions are 25 in. by 16 in. by 9 in. high, and the list price is £7 10s.

A Portable Tapping Machine

A light portable tapping machine recently introduced by the CONSOLIDATED PNEUMATIC TOOL CO., LTD., Egyptian House, 170, Piccadilly, London, W.1, is designed to afford much more rapid tapping than by the hand method, and the elimination of most of the handling charges as compared with a fixed machine.

The equipment weighs only 9 lb., and will tap up to ⅜-in. threads. It has an automatic reversing gear brought into action by a backward pull on the machine, and it is well balanced and produces clean-cut threads.

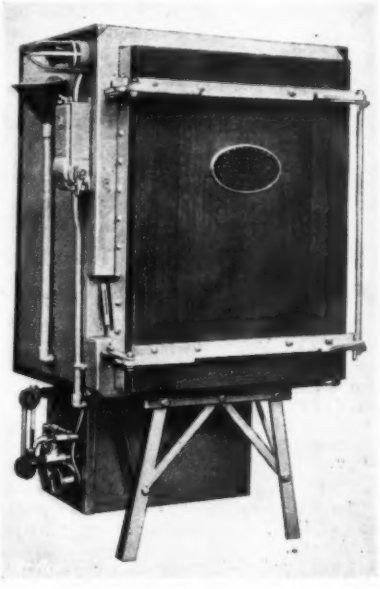
Test observations showed that in a railway engineering shop the "250 M Little Giant Tapper" did a job in 1 min. 36 sec., which formally took 12 min. In another case work which formerly took 8 hours was done in 2 hours.

The 250 M "Little Giant" electric tapper

Electric Sterilising Chests

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, will be exhibiting this year at the Royal Agricultural Show, Derby, a new electric sterilising chest produced jointly with Messrs. Barford & Perkins, Ltd.

The electrical loading is particularly low for this class of equipment; for instance, in the case of a 3 ft. by 4 ft. by 4 ft. chest it is only 8 kW, and for one sterilising process the consumption is of the order of 8 kWh. There is a separate compartment beneath the main chest for the immersion heaters. Steam is generated in this compartment and passes into the main chest, where sterilisation is carried out. Current is controlled by means of a switch, a "high" and "low" heat position being provided in the larger sizes.



The G.E.C. electric sterilising chest

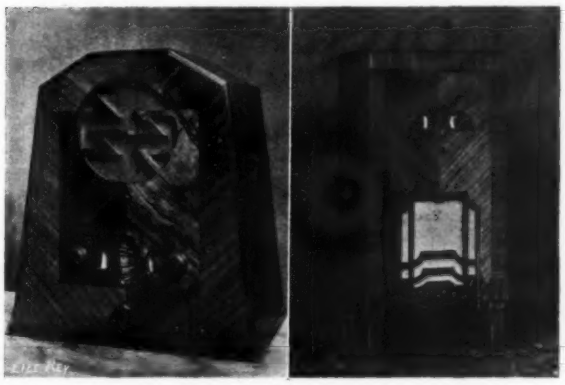
Prices range from £35 for the 4-kW model (12 cu. ft.) to £85 for the 12-kW model (75 cu. ft.).

New Ferranti Radio Receivers

Last week, at the exhibition which MESSRS. FERRANTI, LTD., Hollinwood, held at Bush House, London, we examined two new radio receivers.

The two most important features of the sets are the "electric tuning" and the fact that they will continue to give excellent-quality reproduction when handling 2½ W.

The tuning device shows on an indicator when the best reception point for each station has been reached, so that there is no chance of listening to a programme slightly detuned and distorted. Both automatic and manual volume control are provided, and there is one-knob tuning, 9 kc. separation being obtainable. A Ferranti moving-coil speaker is incorporated in the walnut cabinet.



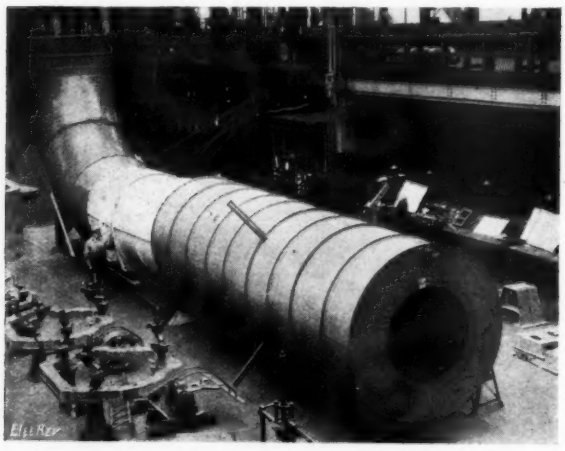
The Ferranti "Gloria Consolette" and "Console" receivers

The "Gloria Console" embodies the same type of receiver

in a different cabinet and is priced at 29 gns., the other model costing 24 gns. Ferranti valves are used throughout, including the recently introduced double-diode-triode.

Fan Developments

New developments in fan design are announced by MESSRS. DAVIDSON & CO., LTD., Sirocco Works, Belfast. An improved "Sirocco" standard multi-bladed fan is known as the "H.E." model, while another modification—the "H.S." (backward bladed type)—has a flat volume/pressure curve and a non-overloading power characteristic. Since taking over the "Aeroto" trade mark rights and patents last year the



A 75-in. "Aeroto" fan for underground railway ventilation

company has carried out a good deal of development work in connection with "Aeroto" screw fans. A recent important contract was for a 75-in. "Aeroto" fan for tunnel ventilation on the Underground Railway's Cockfosters extension; this fan is shown herewith erected ready for test in the company's machine shop. Work is about to commence on the manufacture of the first "Aeroto" mine ventilating installation.

A Valve and Set Tester

The "Radiolab" valve and radio set tester is a new product of the RADIOLAB MANUFACTURING CO., Sandridge Works, St. Albans.

It is priced at 12 guineas, and can be used for all types of valves and sets, checking d.c. and a.c. voltages and currents as well as registering resistance and valve emission.

The advantage of this type of tester is that it allows any number of different tests to be undertaken without dismantling the set.

Fractional Horse-power Motors

A special method of stator construction is embodied in the new ¼-, ⅓-, and ½-h.p. "Neco" repulsion-start induction motors marketed by the NORMAND ELECTRICAL CO., LTD., 3, North Side, Clapham Common, S.W.4.

The stator laminations are assembled in a specially formed light pressing, the edges of which are clinched over in special dies under a hydraulic press, which holds the laminations together under an even pressure of considerable magnitude all round the circumference of the stator and results in very much tighter pack than can be obtained by other methods. This is conducive to much more silent operation owing to the consequent reduction of the possibility of magnetic hum.

One of the new "Neco" motors

The pressing is so constructed that practically all the ventilating air passes over the outside of the stator, and the motor is therefore exceptionally well cooled, and has a greater overload capacity and a lower temperature rise than previous models. The new motors are identical in external appearance and dimensions, with the corresponding 3-phase and d.c. motors. The greater power obtainable from a given frame has enabled the makers to reduce the frame size of the ½-h.p. motors, with a very appreciable saving in weight and over an inch in the diameter of the motor.

The mechanical construction of the new range of motors which operate at 1,400 r.p.m. is the same as before, with the exception of the stator, all machines being dynamically balanced and undergoing a high-voltage insulation test before being dispatched from the works.

A considerable reduction in the prices has been made, amounting to over 20 per cent. in the case of the ¼-h.p. model. The new prices of the ¼- and ⅓-h.p. models are £4 12s. and £5 17s. 6d. respectively.

Calibrated Temperature and Pressure Switches

Pressure- and temperature-operated switches recently introduced by DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton, Middlesex, are suitable for controlling or indicating the pressure or temperature of liquids or gases in ducts, &c.

Both instruments operate on exactly the same principle, *i.e.*, the expansion of a multiple Bourdon tube to one end of which is fixed a mercury switch, the other end being anchored. Successful and accurate operation is due to absolutely direct transmission from the free end of the Bourdon tube to the bracket carrying the mercury switch.

For the pressure instrument connection is direct to the source of pressure, while the temperature instrument is connected through a metal bulb containing volatile liquid. The bulb may be immersed in the fluid to be measured direct, or in a pocket immersed in the fluid. Connection from the bulb to the coil is by capillary tubing. Transmitting instruments are fitted with up to 10 ft. of capillary connecting tube enclosed in flexible bronze protecting tubing with reinforced ends at the instrument and bulb connections.

A Drayton calibrated thermostatic switch

Switches for 10 A, 250 V, a.c. or d.c., are fitted, and the standard range gives a differential between make and break of three to four deg. F. in the lower part of the calibration and two or three deg. F. in the upper part. For the pressure instrument the average differential for normal pressures above 35 lb. is 2 lb. per sq. in. For wider limits an adjustable differential device can be provided. The standard temperature range is 110 deg. F. to 220 deg. F., and the pressure range from 0 lb. per sq. in. to 90 lb. per sq. in.

Each instrument (pressure and temperature) is fitted with a conduited connection box accommodating a porcelain terminal block. The substantial cast-iron case has a glass cover with a nickel-plated bezel. For outdoor installation a hinged weather-proof cover is provided and the setting lever is enclosed.

A Portable Electric Polisher

A new "Rotax" portable electric polisher manufactured by MESSRS. NEWTONS OF TAUNTON, LTD., 319, Regent Street, London, is designed mainly for cars with cellulosed coachwork, but it can be used equally well for furniture, metal work, floors, &c.

It comprises a small universal motor which drives a spindle at 1,200 r.p.m.; on to this spindle fits a steel and felt disc

The "Rotax" portable electric polisher

assembly and a lambswool polishing bonnet, which encloses a 7-in. flexible pad. This bonnet, incidentally, can be taken off to be washed.

The total weight of the apparatus is only 7¼ pounds, and with the two interchangeable handles can be used for long stretches without fatiguing the operator. Twenty-five feet of three-core cab-tyre cable is included, and the price of the polisher is £9 9s.

A New Diehead

To supplement their well-known "Coventry" tools, MESSRS. ALFRED HERBERT, LTD., Coventry, have introduced the new "Tangic" diehead made in two styles for use on stationary or revolving spindles.

The Reorganisation of E.D.A.—And After. By "Candidus"

Propaganda is no substitute for service

AS one who was present—indeed almost in an obstetric capacity—at the birth of the Electrical Development Association, and who has followed the fortunes of that much-discussed child with the keenest interest, I rejoice in the news of a reorganisation that promises to bring it more vigour and more money. I have always regarded the meagre support given to this body as a disgrace to the industry—a disgrace which becomes little short of criminal when neglect is accompanied by cantankerous and destructive criticism. In future, E.D.A. will, I presume, have at least enough money to impress those engineers, managers, directors, and committee members who imagine that a publicity organisation is doing nothing unless it is continually and lavishly advertising in the journals *they* happen to read.

It is as well, however, that rejoicings over this change and anticipations of a big push in the autumn should not distort our vision of the true condition of the supply industry. Essential as the work of E.D.A. may be to the prosperity of the industry, and important as the strengthening of its organisation and finances undoubtedly is, the weak spot of the industry lies elsewhere. I can conceive of the work of E.D.A. being doubled, trebled, quadrupled, without any corresponding effect on the consumption of electricity and the production of electrical appliances.

To put my point in the most arresting fashion, I would say that the industry already has more publicity than it is able to carry. The steady increase in the consumption of electricity during recent years is largely a result of the publicity work begun by various manufacturers and organisations a generation ago and continued on a national basis by E.D.A. since 1919. To-day the response of the public to electrical publicity campaigns is less delayed than it used to be because of this prolonged educative work. The attitude of the people and the Press towards electricity is receptive to a far higher degree than would have been imagined possible twenty years ago. Electricity, in short, is *news*, and as such it secures infinitely more publicity than its rivals do in spite of their generous expenditure in the advertisement columns.

The public appetite for electrical service has thus been highly stimulated. I do not suggest that it cannot further be stimulated by organised publicity on a much larger scale, but I do suggest that it has already been stimulated far beyond the capacity of the majority of supply undertakings to satisfy it. I repeat, with emphasis, *the majority*.

Lethargy and its Causes

"Never," said the poet, "the time and the place and the loved one all together." "Seldom," echoes the observer of our industry, "the rates and the mains and the service all together." There is really no need to call witnesses in support of this contention. Everybody knows how few of the six hundred odd supply undertakings are doing more than merely float on the tide that has been raised for them. But there does seem a need at this period, when E.D.A. has the spotlight and when augmented publicity fills the top of the bill, to point to the really acute problem that still remains unsolved—the problem of the apathetic or the semi-apathetic undertaking. Undertakings are lethargic for one or more of the following reasons:—

(1) The engineer is middle-aged and playing for safety, and a pension; (2) the engineer would like to get a move on but is opposed by a pig-headed committee; (3) the electricity supply undertaking is under the same ownership as the gas undertaking and is consequently being strangled in the name of "co-operation"; (4) the undertaking is in the hands of a board of directors who aim at a stable balance sheet and are reluctant to take even the most elementary trading risks; (5) the engineer honestly believes, on the strength of one or two limited efforts, that he is completely up to date in his publicity and his service to the consumer; (6) the engineer, being an engineer, has no taste or aptitude for selling electricity.

Analysing these causes, we find that there is, in hardly any case, a real desire to promote electrical service as such. The motives at work are conservative, not progressive. To deal with the situation effectively, therefore, we must either reform the mentality of the bulk of engineers, managers, directors, and committee members, or we must replace them by men who are active enthusiasts for electrical development. The alternative courses are intensive propaganda within the industry, designed to ginger up the slumbering diplodocuses, and statutory interference with the hitherto autonomous operations of municipalities and companies. The first is a slow process. It has been going on for a number of years, as the electrical journals, the leaders of the industry, and E.D.A. itself have been hard at work urging supply undertakings to organise propaganda and adequate service. Missionary effort of this kind is, I am afraid, not likely to carry us very far; its subjects are likely to be superannuated long before they are converted. Apparently, then, there is nothing for it but some form of compulsion akin to that adopted when generation was transferred to the Central Electricity Board.

If this conclusion be sound—and I believe it is held strongly by a number of influential people—the sooner we face up to it the better. There has been, to my mind, far too much of the hush-hush element over the changes already effected; the pretence of secrecy about manœuvres which were known to everybody was really rather absurd. I hope that those who assume the initiative in the reorganisation of distribution will realise that frankness is essential to success. This is a matter in which the whole electrical industry is vitally concerned, and when steps are taken to secure Parliamentary powers of one sort or another it is the backing of the industry that will carry the business through. On the other hand, the making of preparations in secret by a caucus, however able and however well intentioned, will arouse suspicion and engender opposition even in quarters which are anxious for reform if not for revolution.

Justifying Their Existence

I foresee, then, that sooner or later every supply undertaking will be formally treated as a trustee for a public service and will be called upon to justify its retention of power by proving its efficiency. There is, of course, no single standard of efficiency, but I do not think it impossible to define the conditions under which an undertaking should be entitled to pursue its work without interference by any distribution board or other external body. A really efficient undertaking must be able to claim the following:—

(1) That it has made a complete survey of its area, estimating the load likely to be obtained for every kind of industrial, commercial, and domestic purpose (How many undertakings, I wonder, have made this market survey in anything but the most perfunctory and partial manner?); (2) that it has planned a capital expenditure programme in the light of its market survey, so that the provision of mains and other distribution equipment will be ready and adequate for full development of all varieties of load; (3) that it possesses a genuine sales organisation with a commercial manager, assistant managers, sales engineers, salesmen, demonstrators, and canvassers, all well trained and *all adequately paid*; (4) that it works to a definite programme of propaganda, publicity and sales development with an allocation which enables full advantage to be taken of every medium—newspapers, posters, pamphlets, leaflets, exhibitions, demonstrations, &c.; (5) that it is fully equipped with showrooms, demonstration rooms, travelling demonstration vans, and other forms of display; (6) that its tariffs are such as to bring every form of electrical service within reach of every section of the community; (7) that its distribution system is adequate for full electrical service; (8) that it has put into force reasonable systems of assisted wiring, hiring, hire-purchase, service, and maintenance; (9) that it is absolutely free from any entanglement, direct or indirect, with competitive services.

Qualify or Go!

If I were Mussolini I would give the supply undertakings a twelvemonth to prove themselves sound upon these nine points before I would grant them the right to remain in possession of their powers. There is nothing arbitrary about any one of them; they are, indeed, all elementary.

In conclusion, let me emphasise again my main contention that national publicity, even if raised to the *n*th power by a transmogrified E.D.A., is not enough. It is not enough even were it supplemented by local publicity on a corresponding scale. Publicity is, after all, only the handmaid of service, and it is in service that our supply industry is so woefully deficient. We would do well, in this connection, to keep constantly in mind the observations made by a gas manager, Mr. A. V. Meldrum, at a recent meeting of the Australian Gas Institute:—

> "It is noticeable that wherever gas is advertised there is a tendency to expect too much from the advertising. Advertising is only one phase of selling, and it is not by any means the principal phase. Strictly speaking, its function is not to sell goods, but to promote thought habits—to make people think along definite lines, and to make them think they are thinking for themselves. Having done this, it will create an urge to buy. The more important task of actually selling the goods rests with the sales staff."

In the Courts

THE hearing was continued last week of the action brought by Marconi's Wireless Telegraph Co., Ltd., against Philips Lamps, Ltd., in which the plaintiffs claimed damages for the alleged infringement by the defendants of letters patent, No. 13636 of 1913, granted to the plaintiffs and Mr. C. S. Franklin for the invention of improvements in receivers for use in wireless telegraphy and telephony.

At the close of Mr. Hubert Gill's evidence Major C. E. Prince, O.B.E., technical managing director to Radiovisor Parent, Ltd., was called. He said that he had considered the Franklin specification and the various prior documents in the case. The Franklin invention was the best and the first complete realisation of the existence of the "no-man's land" between oscillation and the position below and how it could be used in a receiving circuit to increase selectivity.

At this stage Major Prince had to retire owing to indisposition, and the evidence was intervened of Mr. F. C. Topham, of the patent department of Marconi's, and mainly concerned with the issue of licences. He gave evidence as to the number of licences for receiving sets embodying the Franklin patent issued between 1923 and 1928 inclusive.

Major Prince resumed his evidence on June 22nd. He said that in his opinion it was almost impossible to speak of the effect of Franklin's invention on broadcasting without using superlatives. Had it not been for it the popularisation of wireless would have been very much handicapped if not impossible.

Mr. Alan D. Blumlein, a telephone engineer, now with Electric & Musical Industries, Ltd., gave evidence for the plaintiffs and produced an account of tests made on June 24th in the presence of the defendants to determine the inductance and resistance of the alleged infringing apparatus. The general deduction he drew on the issue of amplification was that he could not find in any of the tests one single case where no amplification existed.

Sir Stafford Cripps, K.C., cross-examined the witness and suggested that when witness said he did not find any case where no amplification existed he was limiting himself to power amplification. The witness agreed. He also agreed that what he meant in the tests was the wastage of power and not the useful power which could be effectively applied to some definite purpose.

With regard to the defendants' Lindredge experiments witness agreed that they got a very sharp resonance similar to Franklin's, but said he did not agree that the apparatus was constructed in accordance with Lindredge's idea. This concluded the evidence for the plaintiffs.

Mr. Trevor Watson, K.C., summing up the case for the plaintiffs, discussed the Franklin invention and dealt with what he contended was the proper construction of the specification and the state of knowledge existing in 1913. He said that a considerable effort had been made to show that selectivity was nothing more than sharp tuning. Selectivity was bound up with sharp tuning because any circuit would be selective only for a particular wavelength. He submitted that the discovery by Franklin of the intermediate condition between oscillation and no oscillation and his realisation of the use to which it could be put to obtain greater selectivity was a "stroke of genius" and that this had never been appreciated before by any radio engineer.

On Tuesday last Mr. Moritz, K.C., opened the defendants' case. He pointed out that this action had not been brought until the expiry of the patent's sixteen years of life. He dealt at some length with the defendants' contentions of prior publication, common knowledge, ambiguity and want of subject matter.

The case was still proceeding as we went to press.

Damages Against a Supply Company

Mr. Justice Humphreys, in the King's Bench Division last week, gave judgment in an action in which Messrs. Baily, Grundy and Barrett, Ltd., electrical engineers, Cambridge, claimed from the Midhurst & District Electricity Co., Ltd., damages for alleged breach of contract in connection with the management of defendants' undertaking at Midhurst, Sussex.

Mr. Singleton, K.C., for the plaintiffs, said that a Mr. Dunning in 1927 obtained an order for the supply of electricity in the Midhurst area. The plaintiffs made arrangements to work the order, and the defendant company was formed. Finance was provided by Messrs. Johnson & Phillips, Ltd., and certain agreements were made, the plaintiffs being appointed managers of the undertaking for ten years at remuneration which was to vary with the supply of electricity in the area. Two or three years later Johnson & Phillips apparently wanted their money, and the undertaking of the Midhurst Co. was transferred to a larger and nearby undertaking. The plaintiffs were "left out in the cold." Messrs. Johnson & Phillips had another area of supply at Ringmer, East Sussex, and they offered plaintiffs the management of that undertaking. Counsel contended that they were not obliged to accept that offer in mitigation of damages as the defendants appeared to think.

Mr. Lynskey, K.C., for the defence, said the breach of contract was admitted, but the defendants contended that if the plaintiffs had accepted the management of the Ringmer area they would have suffered no damages whatever.

After hearing the evidence Mr. Justice Humphreys, in his judgment, said there was no defence to the action, and it was only a question of whether the plaintiffs were entitled to damages. He held that plaintiffs were not unreasonable in refusing the Ringmer offer. Plaintiffs were entitled to £3,127 19s. 9d. damages, and there would be judgment for that amount, less a sum to be agreed as plaintiffs would be paid before the expiration of their agreement.

Parliamentary News

(BY OUR SPECIAL REPORTER)

THE Electricity Supply Bill introduced into the House of Lords by Viscount Falmouth was further considered on June 22nd, by a Select Committee presided over by the Earl of Onslow.

Sir Harry Pritchard, Parliamentary agent to the promoters, explained to the Committee amendments in the Bill which had been made since the last sitting. He said that the wording of Clause 1 had now been altered to put county councils in the same position with regard to roads as other local authorities. Clause 2 had also been redrafted. It put electricity undertakers in an analogous position to that of gas and water undertakers with regard to the laying of mains in private streets to afford a supply to premises abutting on those streets.

In a clause giving power to recover costs "in respect of and incidental to" the cutting-off of an electrical supply, the Home Office objected to the words "and incidental to" and they were deleted. At present sums due for a supply of electricity were recoverable in a court of summary jurisdiction whereas sums owing in respect of fittings could only be recovered in a civil court. In the Bill as drafted originally it was provided that the latter might also be dealt with in a court of summary jurisdiction but the Home Office suggested that that procedure should only be adopted when the same consumer owed money under both headings and that the amount recoverable for fittings in a court of civil jurisdiction should not exceed £20. In other cases money owing for fittings should continue as a matter for the civil courts. The Bill had been amended to meet the wishes of the Home Office.

With regard to the clause dealing with the right to enter premises, Sir Harry Pritchard said that the original clause gave power to enter and inspect premises, but by the new drafting it was made clear that the power would be to enter premises and inspect the electrical installation. The right of forcible entry would be limited to unoccupied premises. He understood that the Electricity Commissioners objected to the proposal to take power to cut off the supply.

Sir John Brooke, vice-chairman of the Electricity Commissioners, said they objected to undertakers having an absolute right to cut off the supply in all cases. They thought that that right should be limited to cases of emergency or where there was danger arising from contravention of regulations. Sir Harry Pritchard agreed to amend the Bill in that sense.

In reference to a clause dealing with the acquisition of land for sub-stations, to which the London County Council took exception, Sir Harry Pritchard said an amendment would be introduced to make it clear that the clause did not confer a right to erect a sub-station. That would remove the fear of the L.C.C. that the clause might be used to over-ride building regulations. Amendments would also be inserted excluding from compulsory acquisition land belonging to local authorities or public utility undertakers or parks or land required for the amenity of a house.

There was a good deal of discussion on a clause providing a penalty not exceeding £5 or imprisonment not exceeding two months for interference with electrical works. The chairman said that the Home Office objected to imprisonment in such cases, but he did not quite understand their attitude.

Major W. H. Coles, of the Home Office, said that malicious damage could be dealt with under the general law. It was agreed that the matter should be further discussed between the Home Office and the promoters.

On a clause giving power to cut off an electrical supply in the case of improper use, the chairman inquired whether it was intended to deal with cases where current supplied for power was used for light. He did not want a man who merely did something stupid to be treated as a malefactor. Mr. J. W. J. Townley, engineer and manager of the West Ham electricity undertaking, explained that it was intended to cover the case of a large power user who might use his equipment in such a way as to cause serious fluctuations in the supply to other users. In such a case the consumer might be asked to adapt his apparatus to obviate it, but the consumer might, and sometimes actually did, refuse because it would involve him in expense. The clause was agreed to subject to provision being made for arbitration.

The committee then adjourned to consider its report.

Special Orders

Special Orders have been approved relating to the urban district of Glyncorrwg, Glamorgan, and the rural district of Cookham, Berks.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Duties on Imported Metals

The Import Duties Advisory Committee has under consideration an application for an increase in the import duty on wrought cased tubes of iron or steel; plates, sheets, strip, wire, rods, sections and tubes of brass and alloys of copper, other than nickel alloys; plates, sheets, strip, rods (other than wire rods), sections, wire and tubes (but not including the shells) of copper; plates, sheets and wrought forms of nickel ingots, billets and wrought forms of nickel alloys, other than those containing 60 per cent. or more of nickel; rolled sheets, prepared for use in printing and engraving, strip and wire of zinc. Any representations which interested parties may desire to make should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, S.W.1, not later than July 17th.

The Industrial Welfare Society

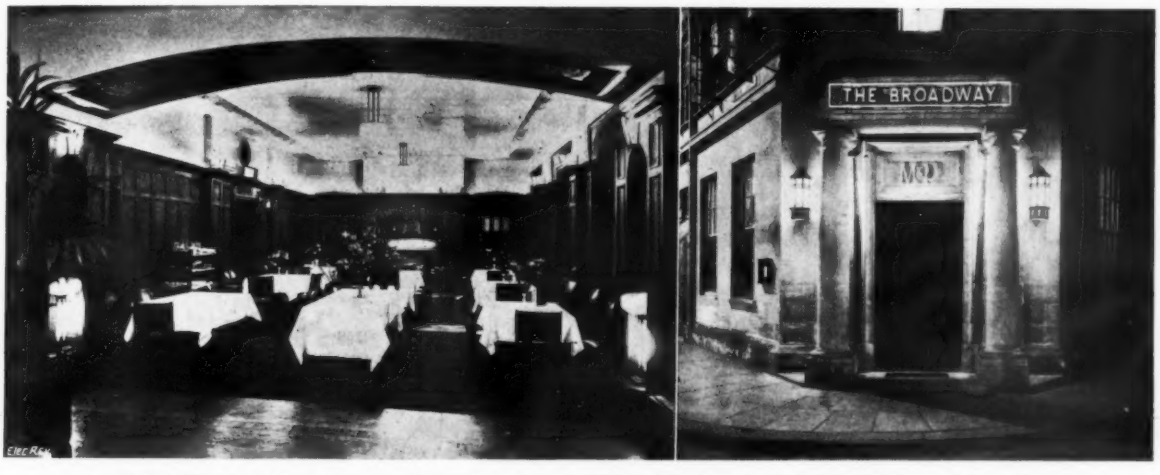
The fourteenth annual lecture conference of the Industrial Welfare Society is to be held from July 7th to 11th at Wills Hall, Bristol. Included in a very full programme will be lectures by Mr. John Grierson on "Films in Industry," Mr. Elton Mayo ("Industry and Social Change"), Dr. J. L. Hammond ("The Historical Background"), Dr. Louis Segal ("Some Aspects of Welfare Work in Soviet Russia"), M. Henri de Man ("Joy in Work"), and the Hon. Mary Pickford ("Welfare Development in Industry"). There will also be visits to a number of works, including those of Messrs. R. A. Lister & Co., Ltd.

Employment During May

According to the *Ministry of Labour Gazette*, employment in the engineering industry during May showed a further general improvement, but remained bad on the whole. The total out of work was 231,402, a decrease of 16,032 as compared with the previous month, the percentage falling from 25.3 to 23.7. Employment in electrical engineering shared in this improvement: the total number unemployed declined from 17,332 to 15,706 and the percentage from 18.4 to 16.7 In the electric cable, wire and lamp manufacturing group there was a decrease in those unemployed from 21,203 to 19,386 (from 18.0 to 16.5 per cent.), but an increase from 4,595 to 4,699 (from 18.3 to 18.8 per cent.) was recorded in the electrical wiring and contracting industry.

Restaurant Lighting

A very distinctive illumination scheme in which colour lighting has been employed with effect has been designed for the Broadway Hotel, Ferensway, Hull. The whole of the interior of the building is lighted by means of Holophane "Hedralite," "Pagoda," and "Ripple-lite" units. The general colour scheme is amber, in which the deepest shade is at the top of the fitting, merging down to the lightest shade at the bottom. The horizontal panels of the "Hedralite" units have white, heavily satin finished glass at the bottom, through which a brilliant downward intensity of light is achieved by use of clear Holophane reflectors. The main lighting of the restaurant (illustrated) is by three 300-W hexagonal "Pagoda" fittings and four semi-indirect wall brackets. The garage lighting is carried out by means of Holophane extensive industrial units, close up to the ceiling, employing 150-W lamps. Industrial-type reflectors are also used in the kitchens and sculleries, whilst the various public rooms and lounges are equipped with medium-size Holophane reflectors. The general illumination effect produced is both uniform and pleasing. The whole installation was carried out by Messrs. Miller & Garness, Ltd., Hull.



A neat form of lighting in the restaurant at the Broadway Hotel, Hull, with a night view of the entrance

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the June 1st cost of living figure (36 per cent. above the 1914 level) will not involve any alteration in wages on the third pay day in July.

Scottish Electricians' Wages

About 1,500 Scottish electricians have had their wages reduced following a decision reached by the Electrical Con-

Power Station Staffs' Salaries

A REVISION of the salaries payable to the staffs of electricity supply undertakings is announced by the National Joint Board of Employers and Members of Staff (Electricity Supply Industry).

The new rates of pay (shown below), which come into force as from July 1st, are based on the average cost of living figures for the past six months and represent 17 points of deduction from the basic rates in the schedule of 1923.

Employés in the London area are entitled to an addition of 5 per cent. to the schedule rates. In any district where conditions justify lower remuneration a deduction of 5 per cent. can be made by mutual agreement.

Title of Grade.	Grade.	Class A 1,000—2,000.	Class B 2,001—4,000.	Class C 4,001—6,000.	Class D 6,001—8,000.	Class E 8,001—13,000.	Class F 13,001—25,000.	Class G 25,001—50,000.	Class H 50,001—100,000.	Class J 100,001 and over.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Deputy Chief Official	1	456 10 0	490 10 0	538 12 0	568 15 0	—	—	—	—	—
	2	393 6 0	422 11 0	465 0 0	492 8 0	533 18 0	—	—	—	—
Power Station Supt. Mains Supt. (with charge of sub-station).	3	351 16 0	378 4 0	418 16 0	442 7 0	481 1 0	500 17 0	538 12 0	581 1 0	639 11 0
Mains Supt. (without charge of sub-station).	4	299 0 0	332 19 0	356 10 0	391 9 0	424 9 0	443 6 0	491 8 0	525 8 0	568 15 0
	5	281 1 0	305 12 0	336 14 0	357 9 0	387 13 0	419 15 0	437 13 0	482 0 0	511 5 0
	6	252 15 0	282 19 0	303 14 0	332 19 0	350 17 0	380 2 0	407 9 0	435 15 0	478 4 0
	7	226 12 0	252 15 0	282 19 0	299 0 0	325 8 0	351 16 0	365 19 0	405 12 0	429 3 0
Shift Charge Engineer	8	226 12 0	226 12 0	252 15 0	278 5 0	293 6 0	318 16 0	341 9 0	354 13 0	389 11 0
	8a	210 7 0	210 7 0	230 9 0	252 15 0	269 15 0	293 6 0	315 0 0	330 2 0	360 6 0
	8b	194 18 0	194 18 0	212 13 0	228 18 0	246 3 0	268 16 0	288 12 0	306 11 0	332 0 0
	9	—	—	194 18 0	208 16 0	225 1 0	244 5 0	263 3 0	282 19 0	303 14 0
	9a	—	—	—	194 18 0	209 12 0	218 2 0	231 5 0	249 19 0	271 12 0
	10	—	—	—	—	194 18 0	194 18 0	205 14 0	219 13 0	240 10 0
	10a	—	—	—	—	—	—	194 18 0	208 16 0	224 6 0
	10b	—	—	—	—	—	—	—	194 18 0	208 16 0
	10c	—	—	—	—	—	—	—	—	194 18 0

tractors' Association. The reduction, which is from 1s. 6½d. per hour to 1s. 6d., took effect in many establishments last pay day. The Electrical Trades Union has protested to the Employers' Association, and the Union is hopeful of arranging a conference to discuss the question of wages and working conditions with a view to reaching an agreement.

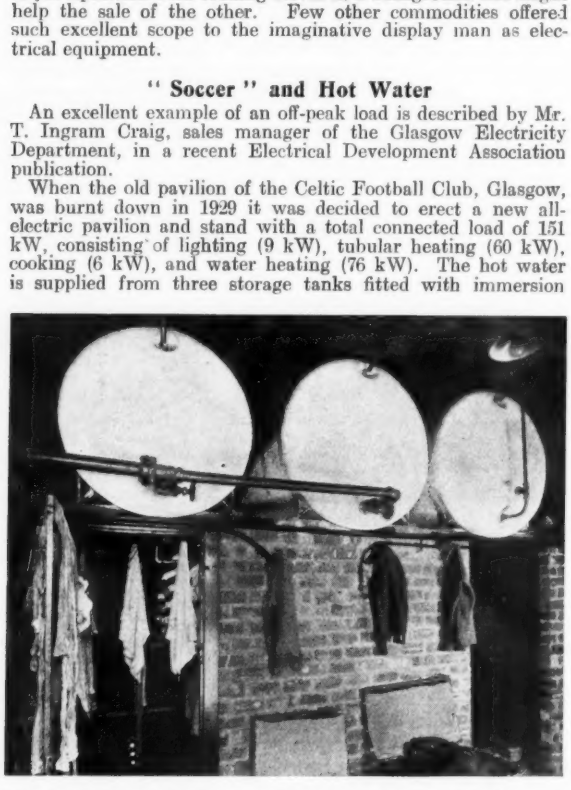
Window Displays

Addressing members of the E.D.A. at Manchester on June 21st Mr. H. G. Bagshaw, of the Liverpool Display Association, said that display, where electrical equipment was concerned, was still in its infancy, but he believed that in the future a new technique would be developed. He criticised the electrical dealer for overcrowding his windows with sundries instead of putting them in a small separate window. Men who were interested in electrical goods wanted to know how they operated. Good might result from making an exhibit of dissected apparatus. He stressed the importance of comparison in electrical equipment, and suggested that by displaying fans in juxtaposition with cooking stoves as a background one might help the sale of the other. Few other commodities offered such excellent scope to the imaginative display man as electrical equipment.

" Soccer " and Hot Water

An excellent example of an off-peak load is described by Mr. T. Ingram Craig, sales manager of the Glasgow Electricity Department, in a recent Electrical Development Association publication.

When the old pavilion of the Celtic Football Club, Glasgow, was burnt down in 1929 it was decided to erect a new all-electric pavilion and stand with a total connected load of 151 kW, consisting of lighting (9 kW), tubular heating (60 kW), cooking (6 kW), and water heating (76 kW). The hot water is supplied from three storage tanks fitted with immersion



The three storage tanks supplying hot water for washing and airing purposes at the Celtic Football Pavilion

heaters to raise the temperature of the water to 200 deg. F. in ten hours, the supply being automatically cut off when the required temperature is reached. In addition, two plunge baths give a depth of 3 ft. of hot water at a temperature of 108 deg. F.

The electricity charges are 5d. per kWh for lighting, ¾d. for heating and day-time water heating, and 0.375d. for water heating from 9.30 p.m to 7.30 a.m. The energy for the heating and hot-water circuits is controlled by a time switch so that no supply is taken between 3.30 p.m. and 5.30 p.m. from Monday to Friday inclusive during the months of November, December, and January. During the football season the ground is used for approximately eighty matches and practice games, and for 1931-32 the cost of the 57,501 kWh consumed was £151 (about 0.63d. per kWh). The supply is d.c., but the layout of the installation is arranged for a rapid change-over to a.c.

New Electricity Showrooms

New electricity showrooms are to be erected in Somerset Place, Teignmouth.

The Poplar General Purposes Committee recommends that provision should be made in the proposed new municipal offices for administrative offices for the Electricity Department.

Recent Contracts

The General Post Office has placed the contract for the new Anglo-French telephone cable with the Telegraph Construction and Maintenance Co., Ltd., with whom the Standard Telephones & Cables, Ltd., will co-operate. The design of the cable incorporates a number of interesting features. There are nineteen star quads of unloaded copper conductors of 66 lb. per mile. The conductors are paper insulated and each quad is separately screened with a layer of metallic tape which has the effect of eliminating electrostatic interference between the circuits in different quads. The lead alloy sheath, which is in one continuous length, is protected from the effects of vibration by means of a cylindrical tube of a special rubber composition, and safeguarded from mechanical damage and abrasion by means of a layer of heavy steel wires. The submarine section, including spare cable, is twenty-nine nautical miles in length and will weigh nearly a thousand tons. Standard Telephones & Cables, Ltd., will manufacture the lead-covered core for the submarine section and will also provide the requisite sections of underground cable between the submarine cable and the repeater stations near the respective coasts. The armouring and rubber covering of the lead-covered core of the submarine section will be undertaken by the Telegraph Construction and Maintenance Co., Ltd., who will lay the cable across the Strait of Dover by their c.s. *Dominia*. It is anticipated that the cable will be completely installed by the end of August.

The Cambridge Instrument Co., Ltd. has recently received orders for over 140 indicating thermometers for use on H.M.S. *Exmouth* and eight Class " E " destroyers, for measuring the temperatures at the boiler stop valves, boiler uptakes, turbine regulating valves, and oil fuel heaters. Cambridge thermometers are also being installed on H.M.S. *Neptune*, *Achilles* and *Orion*, and in connection with the deaerators on the Australian cruisers *Australia* and *Canberra*.

An All-electric Restaurant

The Tricity Restaurant, Strand, London, which has already done some very useful propaganda work on behalf of electric cooking, has just produced an attractive little booklet with amusing illustrations dealing with the restaurant.

The Derby Agricultural Show

At the Royal Agricultural Show, to be held at Derby from July 4th to 8th, a continuous run of 250 ft. of shedding will house a combined electrical display arranged by the Derbyshire and Nottinghamshire and Leicester and Warwick Electric Power Companies, the British Electrical Development Association in conjunction with the Electricity Departments of Derby, Nottingham and Burton-upon-Trent, and the General Electric Co., Ltd. Messrs. Petters, Ltd., will also be exhibiting a representative selection of their oil engines, and combination sets specially suitable for agricultural purposes. There will be demonstrations of the use of all kinds of electrical machinery for poultry and dairy farming, and the usual Electrical Conference for Farmers will be held on July 6th, when a paper will be read by Mr. S. E. Britton, Chester city electrical engineer, entitled " Five Years' Progress in the Electrification of Agriculture Round Chester."

The Scottish Radio Exhibition

The fourth annual Scottish National Radio Exhibition will be held in the Waverley Market, Edinburgh, from October 11th to 21st. The organiser is Mr. T. Percy Bentley, 7, Waverley Market, Edinburgh

A Manchester Woodworking Machinery Display

One of the most comprehensive displays of woodworking machinery ever seen in the Manchester district is now being held in the Demonstration Workshop of the Manchester Electricity Department. This exhibition, which will continue until July 7th, has been arranged as part of a vigorous effort to widen the demand for electricity by showing the advantages of this source of power in the woodworking industry.

Trade Announcements

The British Electrical Trade Protection Association has moved to Cursitor House, 9-11, Cursitor Street, E.C.4 (tele-

The Ipswich branch of British Insulated Cables, Ltd., has been moved to more commodious premises at Sun Buildings, Princess Street. The telephone number is unaltered.

The Hotpoint Electric Appliance Co., Ltd., has moved its Bristol branch to 56, Broadmead (telephone: Bristol 20351). Mr. W. Dudley Morgan has been appointed manager of this office.

The marketing and sales of " Magnavox " moving-coil loud speakers have been transferred to Benjamin Electric, Ltd., which has manufactured these loud speakers for sale in the British and certain overseas and Continental markets for the past two years.

The Bate Electrical Co., Ltd., has moved to larger premises at 7, Union Court, Old Broad Street, E.C.2, with stores at 69, Bishopsgate, E.C.2 (telephone: London Wall 5104 and 3880).

From to-morrow (Saturday) the works and offices of B.E.N. Patents, Ltd., will be centralised at Gorst Road, Chase Estate, N.W.10 (telephone: Willesden 2066).

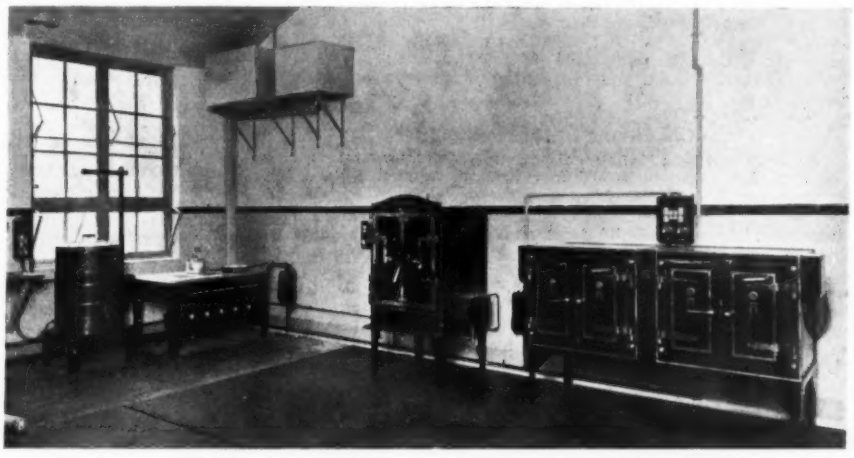
An Electric Tug

At the shipbuilding yard of Messrs. Hall, Russell & Co., Ltd., Aberdeen, on June 22nd, there was launched what is said to be the first British electric tug. It was constructed to the order of Messrs. Robinson & Crosthwaite, Middlesbrough, and is 90 ft. long by 22 ft. beam. The machinery, which is to be installed by the builders, consists of two Brotherhood-Ricardo Diesel engines; a G.E.C. d.c. motor directly coupled to the propeller; and two main and two auxiliary generators. The propulsion control will be from either of four stations—

two situated in the wheelhouse and two on the bridge. The hydraulic-electric windlass and steering gear have been specially designed and manufactured by Messrs. Gemmell and Frow, Ltd., Hull.

Electric Cooking in Yorkshire Schools

The West Riding County Council Education Committee is an active supporter of the electrical industry, and in addition to illuminating all new schools by electricity is endeavouring to influence the minds of the younger generation to modern methods by introducing electric cooking into its domestic science centres. The success of an initial and experimental installation of electric cooking equipment has resulted in "Magnet" cooking equipment being installed at the following schools:—Pontefract Grammar School, Normanton Grammar School, Heckmondwike Grammar School, Woodhouse Grammar School, Ecclesfield Grammar School, Maltby Grammar School, and Honley Grammar School. The number of meals provided daily varies with the size of the school, but at one of the largest establishments three hundred dinners per day for staff and pupils is an average service. The latest school for which the G.E.C. has supplied electric cooking equipment is the new Harrogate Grammar School, and the apparatus supplied is practically identical with that of the other schools mentioned above, and consists of the following units, including switch and control gear:—A 5-kW "Magnet" double oven roaster, a boiling table with five high-temperature boiling plates, a 20-gal. capacity vegetable boiler, a fish fryer, and a hot cupboard with heated top. The equipments are used only for the cooking of meals and not as yet for educational purposes. With power at an average price of 1d. per kWh these electrical kitchens are considered very economical and their coolness and cleanliness are much appreciated by the staff.



The electric kitchen installation at the new Maltby Grammar School

A "Fathometer" Agreement

The International Marine Radio Co., Ltd., and the Submarine Signal Co. (London), Ltd., have concluded an agreement for mutual co-operation in the supply, maintenance, and service of "Fathometer" depth-sounding and radio equipments.

Prices of Materials

Messrs. F. Smith & Co. report, June 28th: Electrolytic copper bars, £41, £6 15s. inc.; electrolytic copper sheets and wire rods, no change; electrolytic copper h.c. wire, 7⅛d., ⅛d. inc.; silicium bronze wire, no change.

Messrs. Edward Till & Co. report, June 28th: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, June 28th: No change in the prices of copper bars (best selected), sheet and rod, and English pig lead.

The E.D.A. July Programme

The July programme of the British Electrical Development includes two window displays which provide a connecting

An E.D.A. electric cooking display

link with the national advertising campaign for electric cooking which is now being conducted in the provincial Press. One of these displays is shown in the accompanying illustration. Three current E.D.A. posters are also illustrated in the programme, while attention is drawn to an attractive box sign which is now available for showrooms. This sign has been prepared from E.D.A. poster No. 990, and gives the effect of a stream of hot water from the tap at the top of the poster with steam rising from the base. A price list of seasonal literature dealing with water heating, cooking, refrigeration, washing and ironing is also given.

The Central Brazil Railway Contract

The proposals of the Metropolitan-Vickers Electrical Co., Ltd., for the electrification of the Government-owned Central Brazil Railway have been recommended for acceptance by the Minister of Public Works and Transport. The scheme is estimated to cost £2,878,733 for British electrical material in addition to 7,494 contos of reis for local construction work. The awarding of the contract now only awaits the decision of the President, Dr. Getulio Vargas.—*Reuter* (Rio de Janeiro).

A Current Transformer

In the last paragraph of the note bearing this heading in page 908 of our last issue there were four references to "kVA." These obviously should have been "VA" as Messrs. Elliott Bros. (London), Ltd., the makers of the transformer, point out.

For Sale

Devon Mental Hospital, Exminster, has a steam generator set for disposal.

An electric welding set is offered for sale by the Yorkshire (W.D.) Electric Tramways, Ltd.

(See our classified advertisements.)

"Patents Explained"

We have been asked to state that "Patents Explained" by Mr. Herbert J. W. Wildbore, 101, Leadenhall Street, London, E.C.3 (5s. net), reviewed in our issue of June 9th, may also be obtained in pamphlet form, post free 8d.

Social Events

The annual sports meeting of the Clesco Sports and Social Club (County of London Electric Supply and associated companies) was held on Saturday last at the company's sports ground, Raynes Park. Heavy rain early in the afternoon had some effect upon the attendance, but nevertheless there was a large gathering which braved the elements to give vocal encouragement to the competitors. The chief trophy of the afternoon was the "Sir Harry Renwick" challenge cup, which is awarded to the district gaining most points in all the events. Last year's holders, City Road, succeeded in retaining the cup, but the strong challenge by head office suggests that next year's competition will be very keen. At the conclusion of the events Lady Askwith presented the prizes, and the meeting was concluded with dancing in the games hall.

The English Electric Co., Ltd., held its annual inter-works sports at Stafford on June 24th. Teams representing the Stafford, Rugby, Bradford, and Preston works of the company took part in a full programme, which included cricket, hockey, golf, bowls, swimming, athletics, fencing, tennis, badminton, motor cycle grass-track races, fire-drill, tug-of-war, and sackball. The Stafford and Bradford works shared the aggregate cup with 11 points each, Rugby and Preston scoring 4 and *nil* respectively. The various trophies, given by the directors and members of the management and staff, were presented to the captains of the winning teams by Mr. J. Bissett, on behalf of the managing director, Mr. G. H. Nelson, who was unavoidably absent. The day's proceedings were concluded with a dance in the Association Hall.

The sixth annual sports and gala day of Pirelli-General Cable Works Social and Sports Club was held at the Club's sports ground, Eastleigh, on June 17th. The sports were not confined to serious events, competitions in lighter vein providing interesting and humorous interludes. Side shows were available on the ground whilst a prize silver band played selections

during the afternoon. Prizes were presented in the pavilion to the winners of events by Mr. G. Martinez, director and general manager of the company, and the day was concluded with dancing, music being provided by the Sports Club's own orchestra.

On Saturday last about 700 employés and friends of Messrs. Herbert Terry & Sons, Ltd., held their annual outing, which this year took the form of a tour of the Peak District. The journey commenced at 8 a.m., and the party proceeded through Alvechurch, Birmingham, and Sutton Coldfield to Lichfield, where a stay was made. After visiting Uttoxeter there was a stop at Alton Towers, and then the party proceeded *via* Ashbourne, Buxton, Bakewell, Winster and Gellia to Matlock Baths for tea. The homeward journey was made through Derby, Burton-on-Trent and Lichfield. The party was accompanied by Mr. Norman V. Terry and Mr. Philip Terry.

Conditions in Australia

The reduction in the national income during the last two years by approximately £200,000,000 has had serious results in all branches of commercial activity in Australia, says a Department of Overseas Trade report on economic and trade conditions. In spite of the tariff policy, manufacturing production declined, and the stagnation of the import trade (see last week's issue, page 911) added to the serious unemployment. With regard to the immediate future there have been signs of a certain improvement in conditions, but this improvement has not been very pronounced, and it is difficult to see in basic economic conditions any appreciable justification for it. Confidence has become greater, but it would be premature to suggest that the country is definitely on its way to recovery.

The E.C.A. Conference

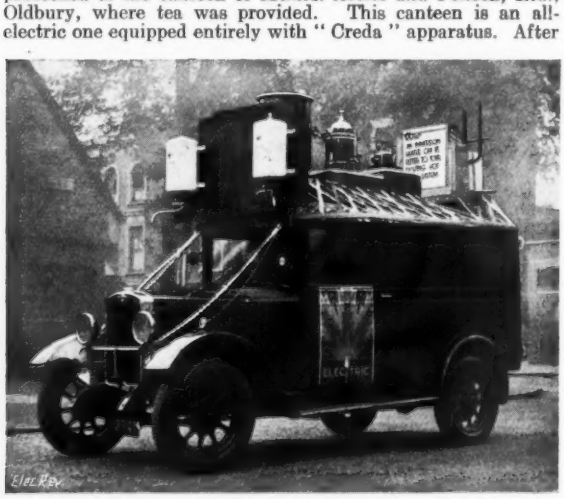
Our readers are reminded that the annual conference of the Electrical Contractors' Association and Allied Associations opens on Wednesday next at Torquay.

The Bristol-Brighton Week

Philips Lamps, Ltd., took a prominent part in the recent Bristol-Brighton week festivities at Bristol. In addition to the well-known loudspeaker van which was employed every day in various parts of the town, Philips floodlights illuminated the University Tower, and the company's amplifying equipment was used by Sir Philip Sassoon when he opened the Airport Pageant.

Works Visit

The Cardiff branch of the Electrical Association for Women visited the Credenda Works of the Simplex Electric Co., Ltd., on June 21st. The proceedings began with a luncheon at the Imperial Hotel, Birmingham, the party afterwards leaving by private buses for Oldbury. The ladies spent a most interesting and instructive time in passing through the various shops and in seeing how "Creda" electric cookers, water heaters, fires and small domestic appliances are made. The party then proceeded to the canteen of Messrs. Accles and Pollock, Ltd., Oldbury, where tea was provided. This canteen is an all-electric one equipped entirely with "Creda" apparatus. After



A decorated van entered by the Hackney Electricity Department in a recent carnival for the Metropolitan Hospital

an enjoyable day the party left by bus for Snow Hill Station at 5.30.

On June 23rd Prince George paid a visit to the works of the British General Manufacturing Co., Brockley, and was shown over the factory where electrical and radio accessories are manufactured.

New Catalogues and Lists

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.2.—The latest edition of this company's general catalogue of electrical supplies is bigger than ever, although it has been found necessary to cover domestic and heating appliances in a separate list. There are 727 pages and the various sections are profusely illustrated and priced. The individual sections are also supplied separately by the company.

Copes Regulators, Ltd., 5/11, Theobald's Road, W.C.1.—A pamphlet illustrating the Copes "Thrustor" valve, an arrangement for easily moving a balanced valve for shut-off purposes.

Castle Fuse & Engineering Co., Ltd., 33, Chester Street, Liverpool.—A leaflet on "Triumph" fuses.

Electric Fires, Ltd., Heatrae Works, Norwich.—Catalogue sections "DB" and "DE" relating to immersion heaters and water heaters.

Petters, Ltd., Westland Works, Yeovil.—A card giving sizes and particulars of a new series of "Atomic" Diesel engines.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—A leaflet illustrating the Benjamin class "B" universal output choke.

Budenberg Gauge Co., Ltd., Broadheath, near Manchester.—A folder describing the "Orbit" cross-pendulum tachometer.

Alfred Herbert, Ltd., Coventry.—Catalogue sheets Nos. H1079 and 1082, giving particulars of the new "Tangio" self-operating diehead.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—Booklet No. 667, relating to "Full-o'-Power" radio batteries, with particulars of the new "No. 1168" 120-V double-capacity battery for class "B" amplification.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham.—A folder describing a new range of "Stelac" pressed steel fuseboards. Also a leaflet giving particulars of new 5- and 15-A indicating control units for use with irons, tubular heaters, and portable appliances.

Ferro-Concrete & Electrical Construction, Ltd.—An illustrated booklet on concrete poles for overhead line work.

Crompton-Parkinson, Ltd., Bush House, W.C.2.—Publication No. A.617, giving details of a new potential indicator for high pressure a.c. circuits.

Derby Cables, Ltd., Derby.—A booklet pointing out some of the merits of "Derby" cables.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Leaflets Nos. 1080A and 6777 dealing with self-acting motor starters and a new type of permanent magnet loud speaker.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, W.C.2.—Folder No. 6289, giving particulars and prices of "Elasta" electric lamps.

Davy Bros., Ltd., Park Iron Works, Sheffield.—A leaflet detailing the company's principal manufactures.

Sykes & Dyson, Ltd., Queen's Mill Road, Huddersfield.—Leaflets describing street lighting time switch-fuses, "Metacor" disconnecting boxes, "Elixum" collapsible lead strip, lead service boxes, and cast-iron protection boxes.

British Insulated Cables, Ltd., Prescot, Lancs.—A booklet entitled "An Alphabet of Industry," illustrating alphabetically B.I. products and their applications. Also a brochure (No. P.F.110) dealing with soil-heating cables.

Wandleside Cable Works, Ltd., 42, Rathbone Place, W.1.—A trade price list (No. 1/33) of "Wandle" electric wires, cables and flex.

Automatic Electric Co., Ltd., Melbourne House, Aldwych, W.C.2.—An illustrated folder pointing out the advantages of the "Strowgerphone" automatic office telephone system.

Howard Rotary Pump Co., Ltd., 25, Victoria Street, S.W.1.—A booklet illustrating and describing the company's water pumps.

W. Canning & Co., Ltd., 133-137, Great Hampton Street, Birmingham.—Illustrated brochures dealing with the latest developments and applications of chromium plating.

Hotpoint Electric Appliances Co., Ltd., 24, Newman Street, W.1.—A catalogue illustrating and describing Hotpoint-B.T.H. cookers.

Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—A leaflet giving particulars of a thermostatic electric regulator suitable for low or high temperatures up to 1,000 deg. F.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A folder giving details of the qualities of Henley tough rubber sheathing.

Ferranti, Ltd., Hollinwood, Lancs.—Leaflets relating to new electric alarm clocks and superheterodyne radio receivers.

Prentice, Ltd., Low Hall Mills, Holbeck, Leeds.—A leaflet describing a new range of neutral type switchgear and fuseboards.

Allen West & Co., Ltd., Brighton.—A folder introducing "Neoglow" d.c. low-pressure neon signs.

Bankruptcy Proceedings

F. J. Jervis and **W. H. Pollnor** (trading as Abbey Radio Service), radio engineers, 1, Blenheim Passage, St. John's Wood, N.W.—This firm failed in September, 1930, and on June 22nd the debtor Jervis applied at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the estate had realised £87, and a dividend of 3s. in the £ had been paid on admitted proofs of debt amounting to £282. The business was only carried on from March to September, 1930, and the failure was attributed chiefly to the fact that the firm was handicapped by price-cutters, who sold goods at less than wholesale trade prices. The discharge was suspended for one month.

J. Mellanby, electrical engineer, Mystery House, Cambridge Road, Waterbeach, Cambridgeshire.—Liabilities of £3.338 with assets estimated to produce £365 and a deficiency of £2.973 were disclosed at the public examination held recently at the Guildhall, Cambridge. The failure was attributed to purchase of premises and expenses of improvements, interest and bank charges, expenses of experiments, depreciation of plant and bad debts. The hearing was adjourned.

F. J. King, radio dealer, 51, Regent Street, Sheffield.—The first meeting of creditors was held on June 16th at the Official Receiver's Office, Figtree Lane, Sheffield, when the statement disclosed liabilities of £338 and a deficiency of £266. Debtor attributed his failure to insufficient turnover to cover overhead expenses. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

S. A. Sears, radio engineer, 98, High Street, Redbourn, Herts.—This debtor's application for discharge was heard recently at the Court House, St. Albans. The receiving order was made in January last. The Official Receiver stated that the matter was a comparatively small one, and the Judge granted the discharge subject to three months' suspension.

C. G. Lowe (Tele-Radio & Electrical Supplies), radio and

electrical dealer, 77, Lansdowne Road, West Didsbury, Manchester.—Public examination, July 7th, at the Court House, Quay Street, Manchester.

G. H. Shindler (Scientific Electric Illuminating Co.), electrical engineer, 14, Craighall Avenue, Levenshulme, Manchester.—Public examination, July 21st, at the Court House, Quay Street, Manchester.

F. M. Clarke, electrical engineer, 3, Joyce Avenue, Sherwood, Nottingham.—Public examination, July 6th, at the County Court House, Nottingham.

J. K. Gardner, electrical engineer, 52, Bell Street, Henley-on-Thames.—Order made April 27th, suspending debtor's discharge for nine months.

J. E. Connell, electrical engineer, 2, Russell Street, Downing Street, Manchester.—Trustee, Mr. F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver, released May 17th.

B. Bell, electrical engineer, Ladbrooke House, London Road, Biggleswade, Beds.—Receiving order made June 20th on a creditor's petition.

J. Vigon (Modern Electrical Installations), 355, Commercial Road, E.—First dividend of 2s. in the £, payable July 7th, at the offices of the trustee, 4, Charterhouse Square, E.C.

Company Liquidations

Violite, Ltd., neon tube and electrical goods manufacturers, 41, Gt. Windmill Street, London, W.1.—A meeting of the creditors was held recently at the Holborn Restaurant, London, W.C., when the chair was occupied by Mr. D. W. Beck, one of the directors of the company. Mr. J. Randall Pullan stated that, by a resolution of the shareholders, he had been nominated as liquidator of the company, and he had also been appointed as receiver on behalf of the debenture holders. The liabilities to unsecured creditors totalled £12,282, of which £6,471 represented the debentures, £3,955 the claims of unsecured creditors, and £1,853, the amount due to Barclay's Bank. The net assets were £6,956, leaving a deficiency of over £5,320. Mr. Pullan said that there was a tentative offer for the assets amounting to £4,000, but nothing had come of this at present, and it would be for the committee to determine whether this offer could be entertained. A resolution was put forward by the principal creditors in favour of the nomination of a member of the firm of Messrs. Wilkins, Docwra & Co., 3, Queen Street, E.C., as joint liquidator with Mr. Pullan, but an amendment was carried in favour of the appointment of Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C., as joint liquidator with Mr. Pullan. A committee of inspection was also appointed, consisting of Mr. Judd (Foster Engineering Co.), Mr. Beck, Mr. Leveridge, and representatives of the Reliance Telephone Co. and the T.B.T. Electrical Co. The following are the principal creditors: Blunt & Wray, £244; Foster Engineering Co., £275; Grainger & Threlfall, £102; Leveridge & Co., £121; Plowden & Thompson, Ltd., £141; Sign Transformer Co., £337; T.B.T. Electrical Co., £112; Tunewell Radio, £177.

"Fay" Radio & Recorders, Ltd., Halco House, Great Peter Street, Westminster, S.W.—The accounts lodged under the compulsory liquidation of this company show liabilities of £5,791, assets of £1,200, and a deficiency of £30,991 with regard to contributories, the issued capital amounting to £26,400. The failure of the company is attributed by the directors to the poor response to a prospectus issued in December, 1932. They are confident that, if they had had sufficient capital to enable them to carry out their sales programme, they could have overcome their financial difficulties and the business would have been successful. Mr. A. T. Chenhalls has been appointed liquidator with a committee of inspection.

Telegraph Condenser Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. J. C. Pidgeon, 6, Old Jewry, E.C. This liquidation is for the purpose of reorganisation only. The business is being carried on by a new company and all creditors will be paid in full.

Medway's Safety Lift Co., Ltd.—Meeting July 25th at 10, St. Swithin's Lane, E.C., to receive an account of the winding-up by the liquidator, Mr. F. Poole.

Makin & Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. P. Toothill, 9 and 11, Figtree Lane, Sheffield.

Davis Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. B. G. Arthur, 1-3, Oxford Court, Cannon Street, E.C.

Patrick's Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. R. Smith Estcourt, 196, Deansgate, Manchester.

W. D. Foster & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. Ashley Oakes, 4, South Place, E.C.

Private Arrangements

J. Burdon & Sons, wireless dealers, &c., Yarm Lane, Stockton-on-Tees.—The creditors of this firm met on June 15th at Stockton-on-Tees. The statement of affairs showed ranking liabilities of £12,323, of which £8,630 was due to unsecured creditors, and £3,694 to partly secured creditors. The assets totalled £14,562, leaving a surplus of £2,239. It was decided that the matter should be dealt with under a deed of assignment with Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., and Mr. Jewitt, Stockton, as joint trustees, with a committee of the principal creditors.

E. C. Cockle (trading as Radio Supplies), wireless dealer, 89, Fore Street, N.18.—At a recent meeting of creditors a statement of affairs was submitted which showed liabilities of £713 and net assets of £127, leaving a deficiency of £586. An offer of a composition of 3s. in the £1 payable in cash was accepted.

L. Benn & Co., Ltd., 8, Colonial Avenue, E.C.3.—A meeting of unsecured creditors is to be held at Winchester House, London, on July 6th to consider a scheme of arrangement which provides for the payment of 6s. in the £ in four equal instalments.

Dissolution of Partnership

Kirkland Electrical Co., electrical engineers and factors, Imperial Chambers, Market Square, Northampton.—Messrs. E. A. Neill and P. H. Kirkland have dissolved partnership. Mr. Kirkland will pay all debts owing by the firm and carry on the business. Debts due and owing to the firm will be received by Mr. Neill.

Electricity Supply

Lighting, Domestic, Power

Annan (Dumfriesshire).—STREET LIGHTING.—The Town Council is considering lighting the streets by electricity.

Annfield Plain.—YEAR'S WORKING.—A profit of £523 was made by the electricity undertaking last year.

REDUCED CHARGES.—An all-round reduction of electricity charges has been made.

Australia.—PROPOSED EXTENSIONS.—Plans for the extension of the rural electricity service in the Riverina area of New South Wales have been prepared by the Public Works Department, and a conference of Ballarat, Bendigo, Geelong, and other municipalities is to discuss a suggested new circuit between Ballarat, Castlemaine, and Bendigo.

Aylesbury.—POWER STATION TO CEASE GENERATING.—The Town Council is to cease generating at the electricity works during the summer months, the whole of the supply required being taken from the Central Electricity Board.

Bangor. — YEAR'S WORKING. — Features of the year's working of the Bangor electricity undertaking are: A further reduction in working costs per kWh sold from 1.92d. to 1.76d.; an increased output of 226,000 kWh, equal to 13.7 per cent. above the previous year; an increase in revenue from £19,964 to £22,937, with a reduction in average price per kWh sold from 2.90d. to 2.74d.; and a further extension of the hire-purchase scheme for wiring and apparatus.

One of the new artistic lighting standards at St. Paul's Cathedral

Bexhill.—INCREASED PROFIT. — The Electricity Committee reports a net profit of £2,128 for the past year, as against £439 in 1931-32.

Billingborough.—VILLAGE SUPPLY PROGRESS.—The underground cabling of the village streets has been almost completed by the Mid-Lincolnshire Electric Supply Co., and already about forty inhabitants are receiving supplies.

Birkenhead.—THE ASSISTED WIRING SCHEME.—In future agreements for installations under the assisted wiring scheme are to provide that the minimum amount payable by the consumer for the hire of the installation shall be 10s. per annum.

Bishop Auckland.—OVERHEAD LINES.—The North-Eastern Electric Supply Co., Ltd., is to erect overhead lines in the West Auckland area.

Blackpool.—THE AUTUMN ILLUMINATIONS.—The Illuminations Committee has decided to spend £13,000 on the autumn illuminations—£3,000 more than last year.

Blean.—FRINGE ORDER.—Canterbury City Council is to apply for a Fringe Order to supply electricity to houses at Broad Oak, Sturry. The South-East Kent Electric Power Co., Ltd., will raise no objection to the application.

Blyth.—LOCAL LABOUR FOR WIRING.—The North-Eastern Electric Supply Co., Ltd., has agreed to the terms set out by the Housing Committee for the employment of local labour for the electrical wiring of the Council houses. A reservation is made, however, that if the tenders received from local contractors are not reasonably near the cost at which the company has had similar work carried out in other areas, it will be permitted to discuss the point with the Council before the work is actually put in hand.

Bradfield.—OVERHEAD LINES.—The Wessex Electricity Co. has applied for permission to erect overhead lines to supply electricity from Tidmarsh to Sulham.

Brighton.—BRISTOL WEEK ILLUMINATIONS.—A sum not exceeding £1,000 is to be spent on special illuminations for the Brighton-Bristol week in September.

STREET LIGHTING IMPROVEMENTS.—The street lighting in Lewes Road is to be improved at a cost of £80.

NEW SUB-STATION.—A sub-station costing £7,253 is to be erected at Preston Drive.

MAINS EXTENSIONS.—Mains are to be extended in various thoroughfares (£1,377).

COUNCIL HOUSE SUPPLIES.—The Electricity Committee has agreed to make a fixed charge of 2s. per week for electricity and hire of apparatus in 280 Council houses being built on the Whitehawk Estate.

ALL-ELECTRIC FLATS.—Messrs. Braybon, Ltd., propose to erect three blocks of four-roomed all-electric flats on their Bevendean Estate.

Burton-on-Trent.—YEAR'S WORKING.—Since January 1st the Corporation generating station has been operating under the direction of the Central Electricity Board. For the year ended March 31st there was an increase in sales of nearly a million kWh, the total sales being 24,525,243 kWh, compared with 23,529,675 kWh last year, all classes of supply showing an increase. The total revenue was £133,934, as compared with £126,390, and the net surplus was £16,791 (£8,020).

Bury St. Edmund's.—CHEAPER SUMMER SUPPLIES.—The Town Council is to charge ½d. per kWh for electricity under the domestic tariff for the summer quarters only.

Cannock.—SUB-STATIONS AND STREET LIGHTING.—The Urban District Council is to spend £3,640 on sub-stations and £298 on street lighting installations.

Chard.—MAINS EXTENSIONS.—The South Somerset and District Electricity Co., Ltd., is to extend its mains to Pound, Donyatt, Broadway Hill, and Broadway.

Chester.—ELECTRICAL BY-LAWS.—The City Council proposes to adopt the I.E.E. Rules as by-laws.

MAINS AND SERVICES.—Sanction has been obtained to the borrowing of £50,000 for mains and services for the extended area.

Coatbridge.—THE SUPPLY QUESTION.—At a recent meeting of the Town Council it was reported that the opinion by Mr. Cameron, K.C., upon the electricity question had been received. The report will not be made public until it comes before the next meeting, but it is understood that it is likely that the Clyde Valley Electrical Company will be appointed agents by the Town Council in all future negotiations with the local company.

Congleton.—ASSISTED WIRING.—The Town Council is to request local contractors to submit fresh tenders for installing electricity under the assisted wiring scheme.

Croydon.—EXTENSIONS.—The Electricity Committee is to extend and relay mains (£5,945) and provide an additional supply to the Surrey Timber Co.'s sawmills in Hampton Road (£205).

Cumberland.—EXTENSION SCHEME.—The Mid-Cumberland Electricity Co. proposes to start work within a month on the electrification of Silloth and Abbey Town, and is seeking permission to erect overhead lines.

Darlington.—LIGHTING OF WHESSOE.—The lighting of Whessoe parish is being considered by the Rural District Council. The Electricity Committee has been approached on the subject and has replied that it cannot see its way clear to supply the Durham Road area.

Denmark.—ELECTRICAL PROGRESS.—The Danish Government Statistical Office has recently issued its official report on the progress of electricity supply in Denmark during 1930-31, which shows that at the end of that period there were 461 central power stations in the country, the total capacity being 379,728 h.p., an increase of 27,124 h.p. during the twelve months. The aggregate output of power in Denmark during 1930-31 is given as 361,620,000 kWh, of which the plants in Copenhagen and Fredericksberg were responsible for about 150 million kWh. In addition 47 million kWh was "imported" from Sweden. It is estimated that in addition to the public supply undertakings there are 1,100 large and small private plants in the country with a total capacity of about 58,000 kW.

Dumfries.—COUNTY ELECTRICITY FOR SANATORIUM.—The Dumfries and Galloway Joint Sanatorium Board is to take a supply of electricity from the county scheme and scrap the installation at the sanatorium. Before next summer it is proposed to make the central kitchen all-electric and install small water heaters in wards and other out-buildings.

East Ham.—HOUSE WIRING.—The Town Council has decided that thirty-two dwellings to be erected at Gooseley Lane shall be wired for electricity for all purposes.

Essex.—LIGHTING INSTALLATION AT POLICE HOUSES.—The County Council has decided to have electric lighting installed at police houses at Romford, Halstead, Dunmow, and Elmstead, at a cost of £125.

Faversham.—CHEAPER ELECTRICITY.—The Town Council has reduced the charges for electricity for lighting from 6d. to 5d. per kWh, and for power by ½d. per kWh all round. Meter rents have been lowered to 4s. per annum up to 10 A, to 6s. per annum from 10 to 20 A, and to £1 per annum above 20 A.

France.—RURAL ELECTRIFICATION.—A fall of 2.59 per cent. occurred in 1932, compared with the previous year, in the amount of electricity sold by the members of the Syndicate of French Producers and Distributors of Electric Current. Rural electrification is still making good progress, and on January 1st this year the number of communes having electricity supplies was 33,567 out of a total of 38,004, the population of the electrified communes being 40,191,601 out of a total of 41,834,923. —*Reuter's Trade Service.*

Garelochhead.—NEGOTIATIONS FOR SUPPLIES.—The Clyde Valley Electrical Power Co. has been approached with regard to a supply for the Garelochhead and Shandon districts.

Glasgow.—PROGRESS DURING MAY.—Under the Electricity Department's scheme 148 houses were wired in May, making a total of 37,557. Hired appliances now number 18,142.

MAINS EXTENSIONS.—Distributing mains are to be laid costing £1,291.

ELECTRICITY FOR SCOTSTOUN COUNTRY HOME.—The Health Committee is to install electric lighting at Scotstoun Country Home (£100).

Grimsby.—NEW SUB-STATIONS.—The Electricity Committee is applying for sanction to a loan of £3,418 for sub-stations in Scartho Road and Laceby Road.

High Wycombe.—OVERHEAD LINES.—The Rural District Council is to raise no objection to the construction of an overhead line to Naphill by the Wycombe (Borough) Electric Light and Power Co., Ltd., and of a similar line at Ditchfield Common and Moor Common, Lane End, by the Wessex Electricity Co.

ELECTRICITY CHARGES.—After communicating with the Minister of Transport respecting the charges of the Cookham & District Electricity Corporation, Ltd., the Council has decided to proceed with an endeavour to secure a reduction.

Irish Free State.—SHANNON SCHEME EXTENSIONS.—A new generating unit, costing £183,000, is being installed at Ardnacrusha, and the work of erecting a fourth penstock and turbine is proceeding rapidly in the hands of the contractors, Messrs. Siemens-Schukert (Ireland), Ltd.

Isle of Axholme.—CANVASS TO BE MADE.—The Yorkshire Electric Power Co. is to make a house-to-house canvass in Epworth and Belton, in the area of the Rural District Council, and it is hoped to have a supply available in the autumn.

Japan.—NEW POWER STATIONS.—Construction work is to commence next month on the 64,000-kW Tsurigame power station of the Japan Power Co., and the Akita Prefectural Office is planning the erection of a 20,000-kW power station, utilising the waters of Lake Tozawa. The latter station will cost about 7,000,000 yen, and will be completed by 1939.

GENERATORS REQUIRED.—The Yahagi Hydro-Electric Co. is to purchase four 15,000-kW generators and other electrical equipment for its Taifu power station.

Leeds.—PROFIT NEARLY DOUBLED.—The net profit of the Electricity Department for the past year was £104,933, nearly double that for 1931-32 (£56,584). After £52,110 had been absorbed as contribution to the year's capital expenditure, there was a surplus profit of £52,823 (£8,046). Sales totalled 186,445,444 kWh, an increase of 32,829,831 kWh.

Leicester.—RELIEF OF RATES.—The Electricity Department last year made a profit of £67,555, of which it is proposed to contribute £10,000 to rate relief.

London.—STOKE NEWINGTON.—The Electricity Committee is to carry out free wiring installations costing £379, and recommends the purchase of 700 meters costing £1,167.

The introduction of a.c. supplies has involved slight changes in certain existing scales of charges.

POPLAR.—The Electricity Committee is to extend mains in the north-central district (£2,380).

FULHAM.—The Electricity Committee is to carry out mains extensions in Avalon Road, Mund Street, and Heckfield Place (£801), new switchgear at Imperial Road and Townmead Road sub-station is to cost £720, and rising mains are to be installed at Munster residences, Filmer Road.

ST. PANCRAS.—Sanction has been received by the Borough Council to loans of £17,225 for switchgear, £2,387 for mains, and £1,132 for plant.

It is proposed to introduce a special charge of 1½d. per kWh for late shop-window lighting.

Mains extensions costing £1,847 are to be undertaken.

HAMMERSMITH.—The Borough Council is to apply for sanction to a loan of £14,541 for mains, services, &c.

It is proposed to light the private road of the Greyhound Racing Association, Ltd., adjacent to the White City (£1,184).

ST. MARYLEBONE.—Sanction has been received to a loan of £25,153 for switchgear.

The electricity undertaking made a net profit of £42,072 last year.

Lutterworth.—RURAL SUPPLIES.—The question of an electricity supply for Kimcote and Walton is under discussion by the Rural District Council.

Macclesfield.—CHEAPER ELECTRICITY ASKED FOR.—The Town Council has asked the Electricity Co. of Macclesfield, Ltd., for favourable consideration to be given to a further reduction in the charges.

Manchester.—A SATISFACTORY YEAR.—An increase in the net surplus of the Electricity Department from £43,332 to £161,129 is reported for the year ended March 31st last. The total revenue showed an advance from £1,864,603 to £1,890,722, but the working expenditure declined from £1,157,783 to £1,102,320. Sales of electricity amounted to 409.7 million kWh (a record for the undertaking), and were 11.1 million kWh above the previous year's figure. New consumers numbered 11,785, bringing the total to 88,160.

Manchukuo.—STANDARDISATION OF FREQUENCY.—The Electric Control Committee is to adopt a standard frequency for the whole of Manchukuo.

Newcastle-on-Tyne.—ILLUMINATION OF TOWN MOOR.—The North-Eastern Electric Supply Co., Ltd., has carried out a survey in connection with a proposal for the electrical illumination of the Town Moor, Newcastle's "fair ground."

Newton Abbot.—EXTENSIONS.—The Rural District Council has approved a scheme for the extension of the mains of the Torquay Corporation to Coombefishacre, Ippleden, where electric street lighting is to be installed.

Nottingham.—A SUCCESSFUL YEAR.—The electricity undertaking having made a net profit of £71,000 on the past year's working—an increase of over £20,000—the Electricity Committee proposes to reduce the charge to ordinary lighting consumers from 5d. to 4½d. per kWh.

Oakham.—PROSPECTS OF SUPPLY EXTENSIONS.—The Mid-Lincolnshire Electricity Co. has informed the Rural District Council that it cannot yet state definitely when a supply of electricity will be given to Market Overton, but a supply will be available this year as far as Burley, and most probably extended to Cottesmore.

Okehampton.—STREET LIGHTING.—The Town Council has accepted a tender for the supply of electricity for street lighting.

Oldham.—YEAR'S WORKING.—An estimated surplus of £10,267 on the past year's operation of the electricity undertaking, as against £10,985 for the preceding year, is announced by the Electricity Committee.

Oswestry.—THE CHANGE-OVER.—The Town Council is to apply for sanction to the borrowing of £6,000 for further work in connection with the change-over of the electricity supply system from d.c. to a.c.

Oxfordshire.—PRESERVATION OF AMENITIES.—The success of steps taken to ensure by co-operation that overhead line extensions were not undertaken without regard to amenities was commented upon in the report of the Oxfordshire Branch of the Council for the Preservation of Rural England at its recent annual meeting. It was stated that the methods of co-operation adopted by the Council had resulted frequently in a more rapid settlement of wayleave questions, and also in some instances it had been found possible to take the lines underground where overhead lines would have seriously affected amenities.

Paignton.—ELECTRICITY CHARGES.—The Urban District Council is to make representations to the Electricity Commissioners with regard to a reduction in the lighting flat rate charged by the Paignton Electric Light & Power Co., Ltd.

Paisley.—ELECTRICITY FOR HOSPITAL KITCHEN.—The Corporation is to use electricity in the ward kitchens of the new hospital.

Pewsey.—ELECTRICITY FOR COUNCIL HOUSES.—The Rural District Council has decided to allow electric lighting to be installed by the Wessex Electricity Co. at Council houses at Ludgershall, Milton, Easton, and Burbage.

Plymouth.—EXTENSIONS.—Cable extensions in fifteen streets have been authorised by the Electricity Committee.

Portlethen.—ELECTRICITY FOR FISHING VILLAGES.—The use of electricity in the fishing villages of Kincardineshire is steadily increasing. In the meantime poles are being erected for the transmission of electricity from Aberdeen to Findon, Portlethen, Downies, and the adjacent districts, and it is expected that supplies will be available in these centres in the early autumn.

Pudsey.—EXTENSIONS.—It is proposed to spend £20,000 on electrical extensions.

Ramsgate.—DECORATIVE LIGHTING.—The Town Council has accepted the quotation of the Ramsgate & District Electric Supply Co., Ltd., for the illumination of the Madeira Waterfall and adjoining rock gardens, partly by flood-lighting and partly by strip-lighting, at a cost of £250.

Rawtenstall.—EXTENSIONS.—The Electricity Committee is to extend mains to supply the Alma district of Cloughfield.

STREET LIGHTING.—The Lighting Committee is to convert to electricity the gas lamps in the Whitewell Bottom and Piercy districts.

Slaithwaite.—REVISION OF CHARGES.—The Urban District Council has adopted the following reduced charges:—Floor rate lighting, from 4½d. to 4d. per kWh, less 2½ per cent. for prompt payment. Domestic heating, from 1½d. to 1¼d. per kWh, less 2½ per cent. Room rate, from 3s. 9d. per room per quarter and ¾d. per kWh for the first 500 kWh, and ½d. per kWh beyond, to 3s. 9d. and ¾d. per kWh for the first 320 kWh per quarter, and ½d. per kWh beyond, less 2½ per cent. Floor area rate, from 3s. 9d. per 150 sq. ft. per quarter, and 1¾d. per kWh, to 3s. 9d. and 1½d. per kWh, less 2½ per cent. discount. Small power supplied from £1 1s. per h.p. installed per quarter, plus ¾d. per kWh, less 2½ per cent. discount, to £1 1s. plus ¾d. per kWh, less 5 per cent. discount. Large power supplies, discount for prompt payment increased from 2½ per cent. to 5 per cent. Street lighting, from 3½d. to 3d. per kWh.

Southend-on-Sea.—ALL-ELECTRIC STREET LIGHTING.—The remaining 2,381 gas street lamps are to be converted to electricity (£3,240), and in future lamps will be kept alight all night.

Stour Valley.—RURAL ELECTRIFICATION.—Considerable progress is being made in connection with the scheme for electrifying the villages in the Stour Valley. The first to benefit was Preston-on-Stour, and the next will be Clifford Chambers and Newbold, followed by Alderminster, Halford, and Crimscote.

Swansea.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £125.

Sweden.—A LONG TRANSMISSION LINE.—What is said to be the longest transmission line in Sweden (337 km.) will be built by the Kraangede Company, to connect the Kraangede waterfalls and power plant in the northern district of Ragunda with some large industrial plants and electric distribution centres farther south, including the Sandvik Iron and Steel Works in Central Sweden. A pressure of 220,000 V will be used, and the cost is calculated at 9.1 million kroner. The line will be completed in about three years.

Tanfield (Co. Durham).—MAINS EXTENSIONS.—Application is being made by the Urban District Council for sanction to borrow £225 for mains extensions at Causey.

Tynemouth.—CHEAP ELECTRICITY FOR SHOPPING WEEK.—In connection with a shopping week during October, the Electricity Committee has decided to provide additional lighting in the main streets and to charge traders 1d. per kWh for all electricity consumed above their normal requirements.

FLOODLIGHTING OF BATHING POOL.—The Town Council is being recommended to improve the floodlighting facilities at the bathing pool at a cost of £138.

Ystradgynlais.—UNDERTAKING PURCHASE OFFER REJECTED.—The request of the Rural District Council for sanction to the purchase of the electricity plant of the Glantawe Electric Supply Co., Ltd., has been rejected by the Electricity Commissioners for the second time. The Council has decided to ask the Commissioners to grant it an interview or to send a representative to Ystradgynlais to inspect the works.

Watford.—FRINGE ORDER.—The Electricity Committee recommends consent to the application of the Chesham Electric Light & Power Co., Ltd., for a Fringe Order in respect of Hogspit Bottom.

POWER STATION PLANT.—The coal-handling plant at the power station is to be improved (£250), and four superheaters remodelled (£300).

Traction

Belgium.—TROLLEY-BUSES FOR ANTWERP.—Trolley-buses, the electrical equipment for which has been constructed by the Ateliers de Constructions Electriques de Charleroi, have been put into service by the Antwerp Tramways Co.

Brighton.—TRACK RENEWAL.—The Tramway Committee is to renew track in Dyke Road (£1,950).

Bury St. Edmund's.—TRAFFIC SIGNALS.—The Town Council has received permission to install automatic traffic signals at St. John's Street, Cornhill.

Cardiff.—TROLLEY-BUS PROPOSAL.—It is proposed to insert a clause in the Corporation's Omnibus Bill authorising the operation of trolley-buses if thought desirable.

Croydon.—TRACK RECONSTRUCTION.—The Tramways Committee has obtained sanction to a loan of £4,545 for track reconstruction in South End.

Glasgow.—THE SUBWAY ELECTRIFICATION.—The Ministry of Transport engineers who have been examining the Subway are of opinion that all stations will require to be reconstructed to ensure efficiency and safety under the electrification plan. This will probably mean an addition of £20,000 to the original estimate of £95,000 required for the electrification. The scheme will take a year to complete.

Huddersfield.—TROLLEY-BUSES TO REPLACE TRAMS.—By scrapping the tram service on the Outlane, Lindley and Waterloo routes and substituting trolley-buses the Corporation estimates that there will be a saving of £75,000.

India.—NEW TRAMS FOR MADRAS.—*Indian Engineering* says that new rolling stock on the tramways costing about £65,000 is to be provided by the Madras Electric Tramways, Ltd. Thirty-four vehicles are to be replaced.

Japan.—ELECTRIFICATION EQUIPMENT.—The principal items of electrification equipment provided by the Tokyo Electric Office of the I.G.M. under this year's programme are: The Yugawara-Mishima transmission line (325,000 yen), the Atami-Numadzu line (600,000 yen), the Mishima sub-station (580,000 yen), the Yugawara sub-station (290,000 yen), the Ichikawa-Funabashi line (193,000 yen), the Funabashi-China line (120,000 yen), the Koiwa sub-station (100,000 yen), the Nakayama and Inage sub-stations (100,000 yen each), the Uyeno-Kitasenju line (120,000 yen), Shinagawa station-Tsurumi line (185,000 yen), the Kofu-Nirazaki line (110,000 yen), and the Haramachida-Hachioji line (100,000 yen).

NEW RAILWAY COMPANY FORMED.—The Sanyo Electric Railway Co. has been established, with a capital of 30,000,000 yen, to take over the Electric Railway Department of the Uji Power Co.

Leeds.—PROPOSED TRAMWAY ABANDONMENT.—A report submitted to the Tramways Committee last week favoured the substitution of buses for trams on the Morley, Horsforth, and Guiseley routes.

South Africa.—NEW TRAMS FOR JOHANNESBURG.—The Finance Committee recommends the Council to purchase thirty-two new tramcars at a cost of £140,000.

Spain.—RAILWAY ELECTRIFICATION MATERIALS.—*Reuter's Trade Service* learns from Madrid that foreign industries will be allowed to supply only 15 to 20 per cent. of the material required for the electrification of the Madrid-Avila line, estimates for which have now been approved by the Minister of Public Works. The work is to commence within the next few weeks.

Stafford.—TRAFFIC SIGNALS.—The Town Council is to have automatic traffic signals installed (£475).

Turkey.—GOVERNMENT'S ELECTRIFICATION SCHEME.—Electrification of part of the railway system is being considered by Turkey, and engineers are to report to the Government as to whether the sixty-mile line from Filios to Eregli, two Turkish Black Sea ports, should be electrified. At present Turkey has no electric railways.—*Reuter* (Istambul).

Tynemouth.—TRACK RECONSTRUCTION.—The Improvements Committee proposes to reconstruct the tram track during the next two years at a cost of £48,720.

Windsor.—TRAFFIC SIGNALS.—The Town Council has applied to the Ministry of Transport for a grant towards the cost (£400) of installing traffic signals at the junction of Osborne Road and St. Leonard's Road.

Communications

Central America.—TELEPHONY.—The Postmaster-General announces that a telephone service is now available to the public from London to San José (Costa Rica), Guatemala (City), Managua (Nicaragua), and to all places in the Republic of Panama and the Canal Zone. The hours of service are between 4 p.m. and midnight daily at present.

The Lewisham Works Committee has informed the London Radio Development Services, who have applied for a sole concession to operate services in the borough, that as the control of such services is at present the subject of a Parliamentary Bill, the application will not be considered until the Bill has become law.

The Tottenham U.D.C. Works Committee has informed Morris Relay Services, Ltd., of its previous decision not to permit any relay service involving the erection of wires across streets to operate in the district.

The Watford Highways Committee has suggested that the articles of association and memorandum of the proposed Watford Wireless Relays, Ltd., should be remodelled and agreed with the local branch of the Wireless Retailers' Association.

The Scarborough Streets Committee has granted an application of Wireless Relay Services, Ltd., for permission to operate a service for a period of seven years and thereafter until the expiration of 12 months' notice.

London.—INTERNATIONAL TELEPHONY.—The number of international calls made daily from London has increased by 30 per cent. since the World Economic Conference commenced. During the first week over 8,000 calls were made from the conference headquarters, where special facilities and equipment have been provided by the Post Office. Of that total 500 were special priority calls by foreign delegates. The delegates of two countries only, Japan and China, are unable to talk to their respective countries. All the other countries represented are in telephonic communication, day and night, with the conference hall or the delegates' hotels.

A night view of one of the principal thoroughfares in Croydon, in which the new "Osira" street lighting system is employed in conjunction with "Osram" gasfilled lamps housed in existing fittings. The scheme was carried out by Mr. F. N. Rendell-Baker, the Croydon borough electrical engineer

China.—LONG-DISTANCE TELEPHONY.—The Minister of Communications is discussing with the Kwangtung Provincial Government a project for a long-distance telephone service to connect Nanking, Shanghai, Canton, and Hankow, the principal cities of south and central China. According to the *Chinese Economic Bulletin*, the Canton authorities have intimated their readiness to co-operate in carrying out this enterprise.

Germany.—STANDARD RADIO RECEIVER.—As the result of representations made to the trade by the Ministry of Propaganda a new broadcast receiver will make its appearance at the next Radio Exhibition. This two-valve "Valksempfänger" (people's set) is intended to be used for reception from the user's local station and the "Deutschlandsender" only. It will be priced at 76 marks (£4 at par) and will be obtainable on the instalment system. Manufacturers have combined in the production of these sets, so that they will all be identical.

Great Britain.—RADIO RELAY SERVICES.—The Tonbridge Urban District Council has granted Wireless Relay Services, of Herne Bay, permission to establish a relay exchange in the town.

The Aldershot Town Council has decided to obtain information from other towns before coming to any decision with regard to the establishment of a relay system.

The Chippenham Town Council has rejected an application from the Swindon Radio Relay Exchange, Ltd., on the ground that a relay service could be provided locally.

The Walsall Town Council has again been approached by several firms, one company offering to pay £500 a year, plus a percentage on the turnover. The Public Works Committee has deferred any decision for a month. Previous applications have been rejected owing to objections from local wireless retailers and the Chamber of Commerce.

The Cannock Urban Council has refused consent to the establishment of a service.

The Gravesend Corporation Housing Committee recommends giving permission to the Gravesend Radio Central Exchange, Ltd., to connect its service to tenants on the Council housing estates.

The Littlehampton U.D.C. has approved an agreement with Rediffusion, Ltd.

Norway.—NEW BROADCASTING STATION.—As a first step in the reorganisation of the Norwegian broadcasting system, which comes under Government control from July 1st, a new high-power broadcasting station is to be erected at Trondhjem to replace the existing low-powered station. The order for the new station has been placed with Marconi's Wireless Telegraph Co., Ltd. The power of the transmitter is 20 kW and it will be adjustable to any wavelength between 200 and 545 metres; the working wavelength will be decided upon in accordance with the deliberations of the Lucerne Broadcasting Conference. The application of the new method of "series" modulation, which will also be incorporated in the new 100-kW transmitter which Marconi's are building for the B.B.C. station at Droitwich, ensures a considerable simplification in transmitter design and provides pure reproduction. Only one stage of modulated amplification is required, with a consequent reduction in harmonic distortion.

Portugal.—TELEPHONY.—Hitherto telephonic communication between Germany and Portugal has been available in the latter country only at Lisbon and Oporto. As a result of recent extensions by the Portuguese telegraph and telephone authorities the international service is now available to all the chief towns in Portugal.

Switzerland.—RELAY SERVICE.—Some 13,000 listeners participate in the relay exchange service, which is owned partly by the State and partly by a private concern.

The Whitworth Society

The annual summer meeting of the Whitworth Society was held in Nottingham on June 21st. The works of Burroughs Adding Machine, Ltd., were visited and then the establishment of the Stanton Ironworks Co., who provided luncheon. During luncheon the ceremony of inducting the new president, Mr. E. R. Dolby, was performed by the retiring president, Professor D. A. Low. In the afternoon the party visited the new factory of Messrs. Boots, Ltd., at Beeston, tea being provided by the company, and the new buildings of Nottingham University College.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—September 12th. Posts and Telegraphs Department. Automatic telephone switching equipment. (A.Y. 11848.)*

Belgium.—BRUSSELS.—July 12th. Commune de Saint Gilles-lez-Bruxelles. 6,000 m. of 750-V, d.c. armoured cable of 10 sq. mm. section. Particulars for 5 francs from Service de l'Electricité, 40, Rue Fernand, St. Gilles, Brussels.

Colchester.—July 24th. Royal Eastern Counties Institution, Ltd. Electrical installation at new home for mentally defectives. (See this issue.)

Darlington.—July 10th. Corporation. Trolley vehicles. June 23rd.

Douglas (I.O.M.).—Town Council. Electric lighting installation at White Hoe Isolation Hospital. Town clerk.

Dunfermline.—July 19th. Town Council. Various works, including electric lighting, at forty-four houses. Mr. D. H. Shaw, burgh engineer (deposit £1 1s.).

Farnworth.—July 10th. Electricity Department. Cables and 300-kVA transformer. (See this issue.)

Fife.—July 10th. County Council. Various works, including electric lighting, at twenty houses at Kincardine. Messrs. John Fraser & Son, architects, 3, Randolph Street, Dunfermline.

Glasgow.—July 3rd. Corporation. Electric lighting installation at Maryhill police office alterations. Master of Works.

Gosport.—July 4th. Town Council. Electric lighting plant, oil engine, &c., at air-compressing station. Borough engineer, Town Hall (deposit £5 5s.).

India.—SIMLA.—August 14th. Indian Stores Department. Electric lamps. (A.Y. 11853.)*

Midlothian.—July 8th. County Council. Electrical installation at new school at East Calder. County architect, 10, Drumsheugh Gardens, Edinburgh.

London.—ISLINGTON.—August 9th. Electricity Department. H.p. switchgear and other accessories. (See this issue.)

New Zealand.—CHRISTCHURCH.—August 8th. Electricity Department. 11,000-V sub-station switchgear. (A.Y. 11841.)*

Paisley.—July 3rd. Corporation. Various works, including electric lighting, &c., for 354 houses. Master of Works' Office, 16, Gilmour Street.

Portland.—July 15th. Electricity Department. E.h.p. cable, truck type switchgear and meters. (See this issue.)

Portuguese East Africa.—LOURENCO MARQUES.—August 25th. Port and Railway Administration. Five floodlighting projectors (3,800 c.p. each). (A.Y. 11860.)*

South Africa.—JOHANNESBURG.—July 14th. Rand Water Board. 950-kW steam turbine-driven alternator set and switchgear. (A.Y. 11835.)*

July 13th. City Council. Fifty 50-, 100-, 150- and 200-kVA oil-immersed power transformers. (A.Y. 11857.)*

DURBAN.—September 29th. Town Council. Twenty-two double-deck trolley-buses. Messrs. Webster, Steel & Co., 9, St. Helen's Place, Bishopsgate, E.C.3 (deposit £3 3s.).

July 14th. Telephone cables (A.Y. 11844)* and telephone wires and apparatus (A.Y. 11845.)*

Southend-on-Sea.—July 7th. Electricity Department. Uniform clothing. June 23rd.

Upton (CHESHIRE).—July 10th. Mental Hospital Visiting Committee. Electric lighting and power equipment at the Mental Hospital. Messrs. Sloan & Lloyd Barnes, consulting engineers, 34, Castle Street, Liverpool (deposit £2 2s.).

West Riding.—July 10th. Education Committee. Installation of electric lighting at Askern Moss Road new infants' school. Education Officer, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barnes.—Town Council. Accepted. Automatic traffic control signals at the junction of Upper Richmond Road and Sheen Lane (£313, with £38 for maintenance for the first year, and £46 for subsequent years).—Automatic Electric Co., Ltd.

Bexhill.—Electricity Committee. Recommended. Two feeder pillars, distribution unit, &c. (£133).—W. T. Henley's Telegraph Works Co., Ltd. Meters for twelve months.—British Sangamo Co., Ltd. Paper-insulated cables for twelve months.—Enfield Cable Works, Ltd.

Highways Committee. Recommended. Traffic signals (£366).—Automatic Electric Co., Ltd.

Chester.—Electricity Committee. Recommended. Supply and installation of cables for three years.—Callender's Cable & Construction Co., Ltd.

Health Committee. Recommended. Installation of electric air blower at hospital laundry (£93).—Thomas Bradford & Co.

Clydebank.—Halls and Baths Committee. An artificial sun lamp, and a standard "Solax" lamp and interval timer for the new Municipal Baths, Bruce Street (£77).—British Hanovia Quartz Lamp Co., Ltd.

Glasgow.—Municipal Transport Committee. Accepted. Copper bonds.—British Insulated Cables, Ltd. Copper trolley wire.—London Electric Wire Co. and Smiths, Ltd.; British Insulated Cables, Ltd. Pantographs.—English Electric Co., Ltd. Welding machines.—Murex Welding Processes, Ltd. Electrodes (twelve months' supply).—British Oxygen Co., Ltd.; Murex Welding Processes, Ltd.; Welding Rods, Ltd.; Quasi-Arc Co., Ltd.

Education Committee. Accepted. Electrical work at Possilpark School extension (£621).—Woodward, Sons & Co., Ltd.

Libraries Committee. Accepted. Cinema outfit for Gorbals New District Library (£384).—Chalmers, Ltd.

Grimsby.—Cleansing Committee. Accepted. Battery for electric vehicle (£200).—Chloride Electrical Storage Co., Ltd.

Electricity Committee. Accepted. Cables (£3,071).—Johnson & Phillips, Ltd.

Llandudno.—Town Council. Accepted. Work in connection with the assisted wiring scheme.—Evans & Evans.

London.—FULHAM.—Highways Committee. Recommended. Installation of traffic signals (£100).—Revo Electric Co., Ltd.

Electricity Committee. Recommended. Meters.—Measurement, Ltd.; Hornby & Co., Ltd. Two h.p. switchboards for sub-station (£183).—Ferguson, Pailin, Ltd. Two l.p. circuit breaker panels (£50).—British Thomson-Houston Co., Ltd. Cable.—W. T. Henley's Telegraph Works Co., Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Traffic signals.—Siemens & General Electric Railway Signal Co., Ltd.; Automatic Electric Co., Ltd.; Laurence, Scott & Electromotors, Ltd. Transformer (500 kVA).—Hackbridge Construction Co., Ltd. Meters.—Chamberlain & Hookham, Ltd.

STEPNEY.—Electricity Supply Committee. Recommended. Meters.—Measurement, Ltd. Meters and demand indicators.—Reason Manufacturing Co., Ltd. Combined meters and demand indicators.—Aron Electricity Meter, Ltd.

Works Committee. Recommended. Installation and maintenance of traffic signals for two years (£571).—Revo Electric Co., Ltd.

Todmorden.—Electricity Committee. Accepted. Switchgear (£601).—Yorkshire Switchgear & Engineering Co., Ltd. Transformers (£465).—Yorkshire Electric Transformer Co., Ltd. Overhead lines (£332).—Craven & District Electrical Construction Co., Ltd.

Tynemouth.—Parks and Sands Committee. Accepted. Floodlights for the bathing pool (£138).—General Electric Co., Ltd.

Warrington.—Health Committee. Accepted. X-ray installation at Borough hospital.—Mottershead & Co.

Whitehaven.—Town Council. Accepted. Erection of an e.h.p. overhead line from the sub-station at Hensingham Road to Loop Road (£1,162).—Macintosh Cable Co., Ltd.

Notes

A Diesel Electric Locomotive Battery

The new Diesel electric locomotive recently completed by Harland & Wolff, Ltd., Belfast, for the Belfast and County Down Railway carries a storage battery consisting of forty-four "Exide-Ironclad" cells, type MVA21, with a capacity of 323 Ah at the five-hour discharge rate in a projecting compartment behind the driver's cabin, which is used for starting the engine and for supplying current for operating the motor-driven exhauster for the vacuum brake system. No alternative starting device is provided, so that a battery of adequate power and reliability is of vital importance, and starting up a cold engine at the beginning of the day takes no more than thirty seconds, subsequent starts being practically instantaneous. The battery is charged by the exciter whenever the engine is running at sufficient speed, the charge rate being automatically adjusted by adopting the "modified constant potential" system.

Preventing Radio Interference

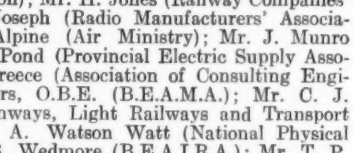
The Institution of Electrical Engineers has set up a committee representative of all electrical interests for making recommendations on interference with broadcast reception arising from the operation of other electrical plant. The committee held its first meeting on June 16th under the chairmanship of Mr. C. C. Paterson (past president) with Lieut.-Col. A. G. Lee, Engineer-in-Chief of the Post Office, as vice-chairman. The committee has set up initially four sub-committees to deal respectively with:— "A": Domestic apparatus, including electric refrigerators, fans, vacuum cleaners, &c.; "B": Larger electrical plant, including generators, motors, lifts, mercury rectifiers, &c.; "C": Traction, including trolley buses, trams and electric railways; and "D": Automobiles and aircraft. The sub-committees are at once commencing their investigations with a view to furnishng the main committee with the data necessary for its further deliberations.

The membership of the committee is as follows:—Prof. E. W. Marchant, D.Sc., President I.E.E. (ex-officio); Lt.-Col. A. G. Lee, O.B.E., Messrs. C. C. Paterson, O.B.E., F. W. Purse, and L. B. Turner, M.A., representing the I.E.E.; Col. A. S. Angwin, D.S.O. (G.P.O.); Mr. E. A. Barker (I.M.E.A.); Mr. D. E. Batty (Society of Motor Manufacturers and Traders); Mr. A. F. Bound (Railway Companies' Association); Sir Charles Carpendale, C.B. (B.B.C.); Capt. J. M. Donaldson, M.C. (Incorporated Association of Electric Power Companies); Mr. H. W. Ellis (E.C.A.); Alderman H. J. Galliers (Wireless Retailers' Association); Mr. P. Good (International

Electrotechnical Commission); Mr. E. Harlow (London Electricity Supply Association); Mr. H. Jones (Railway Companies' Association); Mr. J. Joseph (Radio Manufacturers' Association); Major G. McAlpine (Air Ministry); Mr. J. Munro (A.S.E.E.); Mr. T. A. Pond (Provincial Electric Supply Association); Sir Arthur Preece (Association of Consulting Engineers); Mr. C. Rodgers, O.B.E. (B.E.A.M.A.); Mr. C. J. Spencer, O.B.E. (Tramways, Light Railways and Transport Association); Mr. R. A. Watson Watt (National Physical Laboratory); Mr. E. B. Wedmore (B.E.A.I.R.A.); Mr. T. P. Wilmshurst, M.B.E. (Electricity Commission); and Mr. Johnstone Wright (Central Electricity Board).

A Flatness-testing Device

Serious loss of efficiency results from imperfect thermal contact between the surface of an enclosed or conduction-type (as distinct from a radiant) hot-plate and the bottom of the utensil used thereon. In order to detect such defects without the aid of an indicating gauge or spherometer, use may be made of an appliance devised by Dr. G. Dettmar and described by him in a recent issue of *Elektrotechnische Zeitschrift*. Referring to the diagram, a tubular lamp L is enclosed by a casing of the form shown (in section). The straightedge R, when applied diametrically to the surface of the hot-plate or the bottom of the utensil, reveals any irregularity by light from L reflected through the interstice. The whole of the surface can be checked rapidly by turning R through 30-45 deg. at a time, and to enable the amount of the "air-gap" to be estimated a narrow notch 0.5 mm. or 1 mm. in depth is cut at the centre of R. The height of the spot of light visible at this point can be compared easily with that of the band (if any) visible along the edge of R. As made by the Adler A.G., Hannover, for testing 10-in. hot-plates, this apparatus weighs about 2¾ lb., complete with lamp and connecting plug. If desired, photographic records can be taken.



Non-ferrous Metals Research

The annual meeting of the British Non-Ferrous Metals Research Association was held recently at Birmingham and was followed by a luncheon at which the principal speakers were Mr. Thomas Bolton (chairman of the Council), Sir Harold Hartley, F.R.S. (vice-president, L.M.S. Railway), and Sir Frank Smith (secretary of the Department of Scientific and Industrial Research).

The annual report for 1932 shows that subscribers rose from 159 in 1930 to 207 in 1931, and in 1932 only twelve members dropped out. In spite of this small reduction in membership the expenditure on research has been slightly increased to £17,000 per annum, while the number of major technical inquiries from member firms has risen from 219 to 276. A large number of the researches carried out by the Association are of special appeal to the housewife and the householder. The new lead alloys containing small quantities of cadmium and tin or antimony developed by the Association for cable sheathing are now finding increasing application in other fields. Another research deals with the corrosion of galvanised hot water tanks. Standard methods have been produced by which the amount of small quantities of impurities in tin and lead can be determined in a few minutes with considerable exactness, by the examination of spectroscopic photographs of the materials, without the aid of lengthy chemical analysis. Further work has been done in applying this method to copper and nickel and a start has been made with aluminium. New alloys for service at high temperatures, such as steam turbines are subjected to, are being developed by the addition of small quantities of various elements to copper-nickel alloys. The report records the practical completion of the researches which led to the production by the Association of aluminium brass condenser tubes.

A French High-voltage Laboratory

The equipment which has been installed in the Ampère Laboratories in Paris for the production of extra-high voltages needed for the testing of porcelain, glass, and other insulating materials was demonstrated last week. The apparatus is capable of producing 3,000,000 V.

Appointments Vacant

Electrical engineer and manager for the Long Eaton Electricity Department.

Boiler-house foreman mechanic at the Stepney Council's Limehouse generating station.

(See our classified advertisements.)

Educational

Full-time courses in engineering are provided at the Northampton Polytechnic Institute, St. John Street, London, E.C.1. and entrance examinations will be held on July 12th and 13th.

(See our classified advertisements.)

Makers' Names Wanted

Small electric lighting plant (between 500 to 1,000 watts).

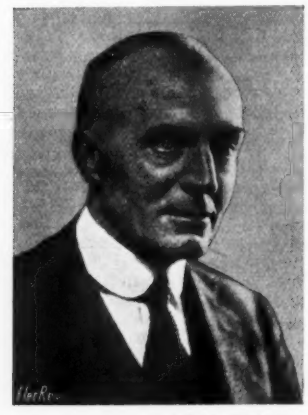
OLGA hair dryer.

A Brown "Bakelite" switch. Patent No. 33357 or 38357.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. T. Goslin, who resigned the position of general manager of the Clyde Valley Electrical Power Co. in December last, has been appointed supply contracts manager to the Central Electricity Board. Mr. Goslin commenced his career with Messrs. Crompton & Co., Ltd., and after holding other positions in England went to Glasgow, where for twenty years he was in the service of the Corporation Transport Department, eighteen of which as chief electrical engineer. He was appointed general manager of the Clyde Valley Company in 1920, and resigned from that position at the end of 1932 for health reasons. In July last year he was invited by the Central Electricity Board to serve on the Technical Consultative Committee for Scotland. Mr. Goslin became an associate of the Institute of Electrical Engineers in 1897 and has been a full member since 1910.



[*Weir, Glasgow*

Mr. E. T. Goslin

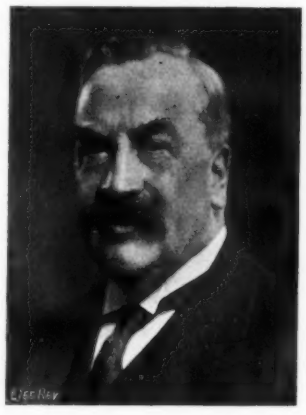
Dr. J. H. Dobson, who has been appointed general works manager of the South African Iron and Steel Industrial Corporation, Ltd., has spent most of his working life in electrical engineering. Following his apprenticeship at the London and North Western Railway works, Crewe, he went to Liverpool University, where he took his degree. He spent some time in electrical engineering research work, and in 1904 was appointed professor of electro-technics at the Transvaal University College, now the Witwatersrand University. In 1908 he was appointed city electrical engineer of Johannesburg, a position he held until the end of 1919, and for several years after he was associated with the firm of Dowson & Dobson, Ltd., at Johannesburg, Durban, and Capetown. He has been engaged in the installation of plant at the Electricity Commission's Congella power station, Durban, and at the Bloemfontein power station, as well as upon the 33-kV line between Capetown and Paarl.

Mr. Frank Crawter, M.I.E.E., who is so widely known in the electrical industry, is retiring from the Chloride Electrical Storage Co., Ltd., on June 30th, after thirty-seven years with the company. Few, if any, amongst us have had so lengthy and so intimate a connection with the battery business. This section of the industry abounds, more than some others do, in experiences affording a remarkable collection of interesting reminiscences, and Mr. Crawter knows most of them, for the period referred to is only a part of his accumulator career. In actual fact, he has for forty-six years been closely connected with the development and applications of secondary batteries, for it was in 1887, after completing a mechanical training at Messrs. Gwynne's on the Victoria Embankment, that he joined the Immisch Electric Works at Kentish Town. This appointment brought him into association with many of the early experiments in the use of accumulators for propelling launches, tramcars, and road vehicles, fields of electrical application which are still largely left for us to conquer. Mr. Crawter enjoys not only the particular regard of his Chloride colleagues—who, by the way, are presenting him and Mrs. Crawter with a mark of

Mr. Frank Crawter

their affection—but the esteem of a host of other electrical friends as well. THE ELECTRICAL REVIEW knows that in wishing Mr. and Mrs. Crawter the best of good fortune it is but voicing the feelings of the industry.

Mr. J. T. Mould, of the Igranic Electric Co., Ltd., has been appointed to the board of the company. Mr. Mould received his early training with the Lancashire and Yorkshire Railway Co. at Manchester, and in 1891 entered the employ of Messrs. J. H. Pickup & Co., Ltd., as their Yorkshire sales engineer. Later he was appointed sales manager at the company's headquarters at Bury. In 1894 he came to London to take over the management of the London branch, and he held this position until 1899, when he joined the electrical department of the Sturtevant Engineering Co., and with the late Mr. A. H. Adams commenced to develop the sale of the Cutler-Hammer electric motor controlling apparatus. In 1905 Mr. Adams formed the Adams Manufacturing Co., Ltd., and built at Bedford the nucleus of the present Igranic factory. The electrical switchgear business was acquired from the Sturtevant Co., and Mr. Mould was appointed sales manager. The Adams Co. went into liquidation in 1913, and the Igranic Electric Co. was formed, and purchased the Bedford works and the electrical engineering branch of the Adams Co.'s business. Mr. Mould joined the new company as sales manager, a position which he has held ever since. He has taken part in the work of the trade associations of which his company has been a member, and has served on committees and panels of the F.B.I., the B.E.A.M.A., the B.S.I., and the E.R.A. In 1925 he played an active part in the formation of the Radio Manufacturers' Association, of which he has been a trustee and member of the Executive Council since its formation. He was vice-chairman in 1928, chairman in 1929, and since 1930 has been a vice-president. Mr. Mould has three sons, Mr. John Mould being engineer and manager to the Leicester Electricity Department, and the others a barrister and a medical practitioner.



[Reginald Haines
Mr. J. T. Mould

Mr. W. Edwards, who for many years has been assistant electrician at the Dean and Chapter Colliery, Ferryhill, Co. Durham, has been appointed chief electrician at Leasingthorne Colliery, Durham.

Mr. D. P. Dunne, managing director of the Chloride Electrical Storage Co., Ltd., who presided at the annual Exide Convention at Torquay from June 27th to 29th

Sir Arthur C. Roberts and **Mr. H. L. H. Hill** have been appointed directors of Electric & Musical Industries, Ltd.

Mr. J. R. Esson, sales manager of Messrs. A. Reyrolle & Co., Ltd., was married on June 24th to Miss Valentine Waugh.

Mr. L. H. Euler, A.M.I.E.E., chairman of the Saxonia Electrical Wire Co., Ltd., was presented to the Prince of Wales on June 23rd on the occasion of the Prince's visit to the Greenwich Industrial Exhibition and Naval Pageant.

Mr. Alfred E. Harte, chief accountant to the South African Electricity Supply Commission, has arrived in England, accompanied by Mrs. Harte. Mr. Harte is spending about six months making a tour of the British Isles and the Continent.

Sir **Ambrose Fleming,** the inventor of the first form of thermionic valve, has been awarded its Gold Medal of Honour by the Institute of Radio Engineers of New York.

Mr. J. Macdonald, who has been in charge of the Invergordon power station for some years, has left to take up an appointment at Brodick.

Mr. A. J. Hills has relinquished his appointment as outside representative for Messrs. McLeod & McLeod.

Mr. G. V. Stanley.—In view of the impending transfer of the tramway undertaking to the London Passenger Transport Board, the Croydon Corporation Tramways Committee has placed on record its appreciation of the services rendered by Mr. G. V. Stanley, the tramway manager, who has been employed by the Corporation since 1904, being first appointed as an assistant. In 1913 he was made responsible for the rolling stock, overhead lines, &c., and was promoted to the post of manager in 1928.

Mr. D. Evans, engineer-in-charge in the Hammersmith Electricity Department, has been appointed assistant mains engineer.

The *London Gazette* announces that **Sir Edward Iliffe** takes the title of Baron Iliffe of Yattendon. His country house, Yattendon Court, is near Newbury, Berks.

Mr. C. Kinsman, A.M.I.E.E., underground mains engineer to the Durban (S.A.) Town Council, has been appointed chief distribution engineer, following the promotion of Mr. J. H. Gyles to the position of assistant borough electrical engineer.

Obituary

Mr. A. Davis.—Mr. Alfred Davis, who for twenty-six years was electrical engineer at the County Mental Hospital at Winwick, and who retired in March, 1927, died on June 21st at the age of 75 years. He was for many years an associate member of the Institution of Electrical Engineers.

Mr. O. M. Andrews.—Mr. Oswald Muskett Andrews, for thirty-six years with the St. James' & Pall Mall Electricity Co., Ltd., died on Thursday last week at Stagsden, Bournemouth, at the age of sixty-six. Between 1888 and 1890 he was engaged with Messrs. Lattimer, Clarke, Muirhead & Co., and it was while he was with this company that he first came into contact with the St. James' & Pall Mall Co. From 1890 to 1892 he held a post with the London County Council. In 1892 he joined the St. James' & Pall Mall Co. as distribution engineer, which position he held until 1926 when he was appointed joint chief engineer with Mr. Rowlands. Ill-health forced him to retire in 1928. He became an associate of the Institution of Electrical Engineers in 1888, and a full member in 1898.

Mr. O. M. Andrews

Mr. T. A. Bloore.—The death occurred at Retford (Notts), following pneumonia, on June 25th, of Mr. Thomas Addison Bloore, the borough electrical engineer and manager. Mr. Bloore, who was thirty-eight years of age, was educated at the Bishop Vesey Grammar School, Sutton Coldfield, and was articled to the late Mr. Trevor Duesbury at the Corporation electricity works, Sutton Coldfield, where he later became chief assistant. Joining H.M. forces in August, 1914, Mr. Bloore served abroad throughout the war. Returning in 1919 to Sutton Coldfield, he remained until 1921, when he obtained the position of senior shift engineer to the Nigerian Government at its new power station at Lagos. In 1924, he returned to England, and for some years was mains assistant in the Stafford Corporation Electricity Department, following which he became district engineer and manager to the Trent Valley Power Co. Mr. Bloore was appointed chief engineer and manager at Retford in August, 1930. The funeral took place on June 27th at Sutton Coldfield, and was attended by representatives of the Sutton Coldfield and Retford Corporations.

Mr. C. E. Pitman.—The death has occurred, at Dawlish, in his eighty-ninth year, of Mr. Charles Edward Pitman, C.I.E., formerly Director-General of Indian Telegraphs. He was appointed to the Indian Telegraph Department in 1868, and in 1876 was on the mission to the Khan of Kalat. He remained in Baluchistan in the work of telegraphic construction, and assisted in completing the field telegraph from Quetta to Kandahar. He was appointed Director-General of Indian Telegraphs in 1889, from which position he retired in 1900.

Mr. P. E. O'Shea.—Mr. Patrick E. O'Shea died last week in the Memorial Hospital at Arklow, County Wicklow. He was formerly a superintendent of the Electricity Supply Board.

Mr. G. F. C. Simpson.—The death has taken place at the age of thirty-one years of Mr. George F. C. Simpson, only son of Mr. Frank A. Simpson, resident engineer of the Newmarket Electric Light Co., Ltd. He was trained as an electrical engineer at the Newmarket works, and was a member of the staff.

Wills.—Mr. William Edwin Gray, electrical engineer and maker of miners' electric lamps, Archer Street, Camden Town, and Leighton Buzzard, left £10,343 (net personalty £7,665).

Mr. F. G. Kellaway, deputy governor and joint managing director of Cables & Wireless, Ltd., joint managing director of Imperial & International Communications, Ltd., and managing director of Marconi's Wireless Telegraph Co., Ltd., and of the Marconi International Marine Communication Co., left £41,051 (net personalty £31,207).

Mr. C. R. Hoare, a director of the Atlas Electric & General Trust, left £13,571 (net personalty £10,054).

Mr. P. Priestley, general manager of the Liverpool Corporation Tramways, left £4,447 (net personalty £3,271).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Curtis Lighting Europe S.A.—Particulars were filed on June 13th, pursuant to Section 344 of the Companies Act, 1929. Capital, 500,000 francs in 500 shares of 1,000 francs each. The company was incorporated in Belgium in March, 1928, to carry on the business of sellers of apparatus and products for electric lighting, &c. Registered office: Hemixem, near Antwerp. British address: Duck Lees Lane, Ponders End. F. A. Hulcoop, of 212, Norbury Crescent, Norbury, S.W., is authorised to accept service of process and notices on behalf of the company. The directors are: W. E. Bush, Edward A. Baldwin and Maurice Saurel, all of Paris; F. V. Hasemore, 95, Woodville Road, New Barnet; K. Curtis and D. Curtis, Winnetka, Ill., U.S.A.; J. Morel, Boitsfort, Belgium; and C. Van der Haegen, Antwerp.

Advance Sound Apparatus Co., Ltd.—Private company. Registered June 19th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, radio engineers and contractors, &c. The directors are: H. A. Turner, "Melville," Tavistock Road, South Woodford, E.18, and E. Turner, 9, Tyndall Road, Leyton, E.10. Registered office: 88, Newington Causeway, S.E.1.

Donophone Public Address Co., Ltd.—Private company. Registered June 21st. Capital, £1,100 in 1,000 10 per cent. cumulative participating preference shares and 100 ordinary shares of £1 each. Objects: To acquire the business of the Donophone Public Address Co. carried on by William L. Overend at 7, Ely Place, Holborn Circus, E.C. The directors are: H. M. McKay, "Coon," Gerrards Cross, Bucks, and W. L. Overend, St. Patricks, Meadow Way, Farnborough Park, Kent. Secretary: J. W. Bell. Registered office: 7, Ely Place, Holborn Circus, E.C.1.

J. Harry Hunt, Ltd.—Private company. Registered June 23rd. Capital, £3,000 in 1,500 ordinary and 1,500 deferred shares of £1 each. Objects: To acquire the business of manufacturers of and dealers in all kinds of electrical lamps and fittings now carried on by John A. H. Hunt, Ltd., at 233, Bradford Street, Birmingham. The directors are: J. Ellison, The Chestnuts, Little Green Lane, Erdington, Birmingham, and J. F. Moxon, Glenthorn, Wolstanton, Staffs. Secretary: J. Ellison. Registered office: 233, Bradford Street, Birmingham.

Challis Transformers, Ltd.—Private company. Registered June 22nd. Capital, £750 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in transformers, electric signs, amplifiers, gramophones and electrical and scientific apparatus, electrical, mechanical and general engineers, &c. The first directors are: J. C. J. Smith (chairman), 55, Earlsdon Avenue, Coventry; G. G. Challis and Mrs. Olive M. Challis, both of 98, Clifton Road, Rugby. Secretary: Olive M. Challis.

British Electrical Industries (Birmingham), Ltd.—Private company. Registered June 15th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in lampshades, electrical fittings and plant, wireless apparatus, &c. The permanent directors are: L. H. Slade, "Cornerholme," Lady Lane, Shirley; and W. T. W. Allin, 30, Lytton Road, New Barnet, Herts, accountant. Secretary: W. T. W. Allin. Registered office: 73, High Street, Birmingham.

Electric Heaters, Ltd.—Private company. Registered June 17th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in water and other heaters of all kinds, electrical appliances, cookers, &c. The subscribers are: F. W. Lockwood, 24, Risingholme Road, Wealdstone, and F. J. Howard, Clifton House, 23, Lansdowne Grove, Neasden, N.W.10. Solicitors: Radford, Frankland and Mercer, 27, Chancery Lane, W.C.2.

Returns of Electrical Companies

International Electric Co., Ltd.—J. J. Ure, 11a, Hart Street, W.C., ceased to act as receiver and manager on June 6th.

Cardiff Electrical Repairs, Ltd.—Capital, £1,500 in 500 preference and 1,000 ordinary shares of £1. Return dated November 30th, 1932 (filed April 20th, 1933). 260 preference and 817 ordinary shares taken up. £577 paid. £500 considered as paid. Mortgages and charges, nil.

Ernest Jones (Bradford), Ltd.—Capital, £3,000 in £1 shares. Return dated January 14th, 1933. 1,173 shares taken up. £1,173 paid. Mortgages and charges, nil.

Submarine Signal Co. (London), Ltd.—Capital, £1,000 in £1 shares. Return dated April 11th, 1933. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Sunbeam Electric, Ltd.—The nominal capital has been increased by the addition of £9,000 in £1 ordinary shares beyond the registered capital of £1,000.

Park Radio & Engineering Co., Ltd.—J. W. Sears, 4, Parkshot, Richmond, Surrey, was appointed receiver on June 17th, under powers contained in debenture dated August 10th, 1927.

Electrical Measuring Instruments Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 29th, 1932. 315 shares taken up. £315 paid. Mortgages and charges, nil.

R. Falshaw, Ltd.—Capital, £5,000 in £1 shares. Return dated December 29th, 1932. All shares taken up. £2 paid, £4,998 considered as paid. Mortgages and charges, nil.

William J. Hook & Co., Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1. Return dated December 22nd, 1932. 400 preference and three ordinary shares taken up. £403 paid. Mortgages and charges, nil.

Faulkner & Co. (Manchester), Ltd.—Capital, £2,000 in £1 shares. Return dated December 20th, 1932. 1,900 shares taken up. £500 paid, £1,400 considered as paid. Mortgages and charges, nil.

Egyptian Power Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated December 31st, 1932. Two shares taken up. £2 paid. Mortgages and charges, nil.

Hart Bros. Electrical Manufacturing Co., Ltd.—Capital, £5,000 in £1 shares. Return dated November 28th, 1932. 4,474 shares taken up. £4,474 paid. Mortgages and charges: £4,500.

Lancashire Electric Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated December 28th, 1932 (filed March 31st, 1933). Sixty shares taken up. £60 paid. Mortgages and charges, nil.

Surrey Cables, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1932 (filed March 16th, 1933). Two shares taken up. £2 paid. Mortgages and charges, nil.

Lincoln Wireless Co., Ltd.—Capital, £1,200 in £1 shares. Return dated December 30th, 1932. 700 shares taken up. £700 paid. Mortgages and charges, nil.

B.S.A. Radio, Ltd.—Capital, £2,000 in £1 shares. Return dated November 11th, 1932. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Plessey Co., Ltd.—Capital, £20,000 in 16,000 preference shares of £1 and 80,000 deferred shares of 1s. each. Return dated March 1st, 1933. 16,000 preference and 60,002 deferred shares taken up. £1,550 2s. paid on 31,002 deferred shares. £17,450 considered as paid on 16,000 preference and 29,000 deferred shares. Mortgages and charges, £24,541.

British Radiophone, Ltd.—Capital, £1,000 in £1 shares. Return dated February 8th, 1933. 2 shares taken up. £2 paid. Mortgages and charges, nil.

City Notes

The General Electric Co., Ltd.—The accounts of this company were abstracted in our last issue (page 925), and the annual meeting was held on June 28th. Sir Hugo Hirst, Bt. (chairman), who presided, in the course of his speech said that while the drop of £44,000 in the profits was regrettable they must consider themselves very fortunate that it was not much greater, especially when they compared their position with that of electrical companies in other parts of the world. We, in this country, had suffered from these conditions mainly because they had imposed on Government Departments and public bodies the need for economy. In consequence, there had been a falling off in the orders received in their heavy engineering departments. The full effect of this reduction had not yet been felt. It would hit them more severely in the current year than it did in the past twelve months, and although there were signs of betterment in various directions they must face the prospect that this might not be reached in time to make up for the loss of business incurred. In mass production articles the volume of consumption had kept fairly stationary, but their production had been shared by too many newcomers in the industry, and in consequence the prices obtained had been very depressed. There were other reasons why the electrical industry might experience a temporary reaction. As an illustration, he mentioned the grid system constructed by the Central Electricity Board. In this connection research and experiments on a large and costly scale had to be undertaken, and while the firms successful in securing contracts might have enhanced their own prestige and that of British electrical engineering in general, the prevalent belief that they also added to their wealth was entirely unfounded. The special machinery required for manufacturing and testing the grid plant involved a heavy initial expenditure; competition was so keen that prices were not too remunerative, and with the successful completion of this great scheme the manufacturers were faced with the problem of what was to be done with the shops, machines and organisation built up to deal with the construction of the grid. Moreover, the establishment of the grid had virtually killed the demand for small and medium-sized turbo-generators and associated plant which used to form the backbone of their engineering shops. Their scientists and engineers were now busy on the task of finding new work to take the place of the old. New machines and tools might have to be evolved, and, owing to the inevitable time lag in such matters, a year or two might pass before the new articles could be sold in sufficient quantities to make up for the lost business. Their heavy engineering shops were not alone in undergoing change. Similar evolutions were taking place in nearly every one of their works.

Important advances had been made in the development of switchgear, transformers, mercury arc rectifiers, and other plant. They had been particularly successful with mercury arc rectifiers; twelve of these, each of 1,500-kW capacity, were now operating satisfactorily on the London Electric Railways, while another set had been supplied to the L.M.S. Railway. They had given close attention to electrically operated ships, and the *Monarch of Bermuda* and the *Queen of Bermuda* had been electrically equipped by the G.E.C. In connection with the electrification of railways, their latest important effort was the equipment of the Manchester-Altrincham line at 1,500 V. He was satisfied that as soon as the new London Transport Board had organised itself for action, railway electrification would receive a great impetus. The demand for tramway equipment was decreasing, but the merits of the alternative offered by the electric trolley bus were being more

and more widely appreciated, and they had already received satisfactory orders both from this country and from Australia. The demand for steam turbines having dropped, in their search for other work they had acquired the British Empire rights in the Chance system of cleaning coal and an installation was now completed. Important changes had also been taking place in their lamp works. The new electrical discharge ("Osira") lamp had already proved a great success. Their illuminating engineering department kept them in line with all opportunities of fresh lighting business in the street, in the home and in the air. Their telephone works had developed the manufacture of radio receiving sets with excellent results. They had also developed various supervisory control systems for lifts, railway operations and other purposes, and in the telephone field itself progress had been made with repeater systems for long-distance telephony and with many promising new ideas for improving communications. These were at their beginning, and few of them had so far contributed to the profits of the company. Marked success had recently been achieved with the Osram "Catkin" valve. Referring to the increasing output of electricity, Sir Hugo said that the main cause was the domestic demand, while on the industrial side electric furnaces, baking ovens, and other industrial appliances were making considerable headway. They were constantly making improvements in their domestic appliances. In particular they had been very successful with the storage water heater and the storage cooker. Regarding the extension of electricity supply into rural areas, they had taken a leading part in designing and manufacturing motors and other appliances suitable for agricultural needs. The development of valve and radio technique was pointing to the possibility of receiving and transmitting messages over long distances with apparatus little larger than a motor headlight. The photo-electric cell which was already applied to the precise and automatic control of many of the more difficult factory operations and also illumination systems was destined to find many more applications, while the talking film and the photo-electric cell suggested the production of music without the medium of musical instruments and the creation of new tones and harmonies beyond the capacity of any instrument yet invented. Sir Hugo concluded his speech with references to the World Economic Conference and the Imperial Conference at Ottawa, and said he was convinced that no restoration of order and prosperity would be possible until the people of the British Commonwealth settled their own affairs.

W. T. Henley's Telegraph Works Co., Ltd., report a profit for the year ended March 31st last of £300,298, as compared with £328,664 in the preceding year. After deducting debenture interest, &c., and adding £557,496 brought in, there is a total of £785,805 available. The reserve receives £50,000, and it is proposed to pay a final ordinary dividend of 2s. 6d. per share, less tax, making 4s. per share for the year (same), and a cash bonus of 2s. per share, less tax (same). The balance carried forward is £516.901. The report states that the profit and loss account has been materially affected by the reduced return on investments, but the turnover of the business increased during the year. The company's subsidiary, Henley's Tyre & Rubber Co., Ltd., made a profit for the year, but no part of this profit has been brought into the accounts of the parent company. Meeting: July 7th.

The Electric Furnace Co., Ltd.—Presiding at the annual meeting on June 19th, Mr. D. F. Campbell (chairman) said a feature of the year's work had been the trading of their subsidiary, the Electric Resistance Furnace Co., Ltd., which had made a good profit. In the home market there were definite signs of improvement, both in the brass and steel trades, and this had resulted in an increase of work at home. In England, two 5,000-kW arc furnaces had been successfully put to work, and important works extensions had been undertaken in the Birmingham and Sheffield districts. Two interesting installations in South Africa had resulted from the general improvement in gold mining in that country, the first being for extensions of a steel melting shop at Vereeniging, and the other for furnaces for the manufacture of carbide. A heat-treatment furnace, equipped with a Gill fan, for forced air circulation had been developed to meet the growing demand for this type of equipment. Trade with Sweden, Belgium and France had been satisfactory. The arrangements for the exchange of technical information, and other business alliances with British and foreign companies, had been strengthened, and the exploitation of some important new patents had been undertaken on favourable terms.

The Jerusalem Electric & Public Service Corporation, Ltd.—The annual meeting was held in Jerusalem on June 20th. Mr. L. Le Bouvier (the local director) presided in the absence of Mr. W. Shearer, and read the chairman's speech, in the course of which he said that substantial progress had been made in the development of their undertaking. In September last the number of consumers was about 4,300, and in the seven months to the end of their financial year on March 31st last, some 700 more were connected, making a total of approximately 5,000. The increase in consumers was largely due to the fact that the smaller domestic consumers were taking advantage of the facilities put at their disposal. Further extensions were now in hand and construction was at present proceeding for the supply of electricity to Ramallah. In addition, several extensions had been made to the street lighting in Jerusalem and Bethlehem. Arrangements were also being made to provide extensions and to reinforce existing supplies in Rehavia, Mekor Baruch, Mekor Haim and several other districts. As the increase in demand for electricity had been up to expectation the board had made arrangements for the installation of an additional unit of 500-kW capacity. They were pleased to be able to suggest the payment of a maiden dividend (2 per cent., less tax) on the ordinary shares.

The Globe Telegraph & Trust Co., Ltd., shows a net revenue of £239,209 for the year ended May 31st last, against £45,042 in 1931-32. The addition of £5.849 brought forward gives an available balance of £245,058. The revenue includes two distributions on the 5½ per cent. cumulative preference stock of Cables and Wireless, Ltd. Three interim ordinary dividends of 1s. per share, free of tax, and three preference dividends of 3s., have been paid, and the final dividend is 2s. on the ordinary shares and 3s. on the preference. A balance of £104,701 is carried forward. Presiding at the annual meeting held on June 21st, Lord Middleton (chairman) said that during the year the Direct Spanish Telegraph Co., Ltd., leased its system to Imperial & International Communications, Ltd., at a rent that it anticipated would enable a payment of 6 per cent. per annum to be made on the ordinary shares. The electricity undertakings in which they were interested continued to show steady progress, and they might anticipate further capital requirements as conditions improved.

The Oxford Electric Co., Ltd., reports a net revenue, including £17,493 brought in, of £29,379, as compared with £115,493 in the preceding year. The ordinary dividend is maintained at 7 per cent. and £6,379 is carried forward. In the previous year £75,000 was placed to reserve. The report states that 1932 was the first full year during which the company worked in its reduced area and under conditions of supply imposed upon it by the Electricity Commissioners. The period, however, cannot yet be regarded as a normal year, as the company remains over-capitalised. Steps initiated for rectifying this have had to be suspended for reasons which will be explained at the annual meeting to be held in Oxford on June 27th.

Berry's Electric (1928), Ltd., reports a trading profit for the year ended March 31st last of £6,968, as against £10,886 in 1931-32. After deducting the debit brought in (£166), directors' fees, income tax, and note interest (£5,940), there is a debit of £826. A sum of £1,429 is transferred to reserve for leasehold premises, making a total debit balance to go forward of £2,255.

Broadcast Relay Service, Ltd.—It is reported that the subscription list in connection with the issue of £125,000 7 per cent. redeemable debentures at par and 125,000 ordinary shares of 1s. each at par opened on June 21st was closed on the same day, the issue having been oversubscribed.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to contrary: Celynin Electric Light Co., Ltd.; Electrical Manufacturers' Co. of Great Britain, Ltd.; Luth & Rosen Electric Co., Ltd.; Phillips Magnetos, Ltd.; Robin Electric Lamp Co., Ltd.

The Victoria Falls & Transvaal Power Co., Ltd., has declared a final dividend of 12 per cent., on the ordinary shares, making 15 per cent. for 1932 (as for 1931), and a bonus of 5 per cent., less tax, payable out of the balance of exchange.

Greenwood & Batley, Ltd., have announced a dividend for the year ended March 31st last of 2½ per cent. (same).

The London Electric Wire Co. & Smiths, Ltd., has announced an interim ordinary dividend of 1¼ per cent., less tax.

The Montreal Light, Heat & Power Consolidated is to pay a quarterly dividend of 38 c. on the common shares (same).

The Lisbon Electric Tramways Co. reports a net profit for 1932 of £169,169, as compared with £172,253 in the preceding year, to which is added £39,740 brought in, making £208,909. General and depreciation reserves receive £68,000, and it is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent. (same), leaving £38,803 to be carried forward. The number of passengers carried was 118,725,708, a decrease of 2,867,144.

The Kalgoorlie Electric Tramways Co. reports a net profit for the year ended March 31st last, before charging depreciation, of £4,710, as against £6,101 in the preceding year. The balance of the 5 per cent. "A" debenture stock having been redeemed, the sinking fund provided for redemption of this stock has been transferred to the credit of capital expenditure.

The Great Northern Telegraph Co. of Denmark has declared an interim dividend of 2½ per cent. (unchanged).

Stocks and Shares

TUESDAY EVENING.

AT the end of this week, the London Passenger Transport Bill, which became an Act on April 13th last, comes into definite operation. On Saturday in this week there will be transferred to the London Passenger Transport Board certain existing transport undertakings in the London Passenger Transport area. The existing securities fall out of the list, and are replaced by others of the Authority. Meetings are being held to pass the necessary formal resolutions for the winding up of the old companies and the exchange of their stocks into the new securities. It had been hoped in the Stock Exchange that matters would be sufficiently far advanced to enable dealings to begin at once in these new stocks. Various impediments have occurred, however, that will delay for a week or so the commencement of a market in the London Transport issues. Meanwhile, the prices of the stocks in the existing companies, having already been adjusted to the quotations at which the new stocks are likely to open, show little variation on the week.

The Undergrounds

Underground Electric ordinary shares are better at 23s. 6d. upon statistical calculations in regard to the break-up value of the shares. Some of the estimates put this value at 26s., others at 27s., some still higher. In cases such as this, optimism has scope for talent. Metropolitan consolidated stock is 1 better at 73; District ordinary remains unchanged at 69½. The chief point of speculative interest aroused by the scheme is the price at which investment will be likely to accept the new "C" stock. It is easy to estimate the value of the other stocks; that is to say, the "A," the "B," and the T.F.A., but the dividend on the "C" is a variable quantity. At the moment, it is excepted to come to market on the basis of 70 or thereabouts.

There is on offer £2,500 City and South London 4½ per cent. redeemable second debenture, and £1,000 Central London stock

of similar character, both guaranteed as to principal and interest by His Majesty's Government, at 108 ex dividend, the yield being £3 9s. per cent. allowing for redemption. The stocks are dated 1942-1972.

Politics and Prices

Proceedings at the World Economic Conference are being closely watched by investment and by Stock Exchange markets. The action of the United States Government forms the principal focus of attention. Fresh questions arise every day as to whether the President will consent to stabilisation in one shape or another. He has definitely stated his refusal to agree to such a plan at present, but world conditions may prove to be too strong for him to stand against, and it would appear at this particular moment as though Mr. Roosevelt were weakening in his previous attitude. The result is seen in lively speculation amongst American utilities, and in certain of the commodity and base metal markets. The uncertainty is intensified by a renewal of the expectation that both France and Holland are not unlikely to be forced off the gold standard to which they have so tenaciously clung. One effect of this has been to cause a rise in the shares of rubber-producing companies with estates situated in the Dutch East Indies.

American Utilities

American Telephone and Telegraph, after being up to 160, relapsed to 152½xd., and Internationals, from 23, gave way to 21¾. Prices have followed the course of the American exchange. As this becomes changed from time to time in the Stock Exchange, a fresh bout of activity occurs, which, if it does nothing else, provides business for the circles that are now actively speculating in American securities. Shawinigan Water shares have strengthened to 19. Other Canadian-American-Mexican utilities are generally good. Brazilian Tractions at 17 make an exception, the price being 1¼ down. Mexican descriptions are better. The 5 per cent. bonds of the Mexico Tramways are 5 up, and those of the Mexican Light and Power have gained 2. Mexico Tramways common have once more reached double figures, at 10.

Cables and Wireless

Cables and Wireless stocks retain their prices and the improvements which took place last week. The market is recovering from the disappointment that overtook stale bulls of the stock in connection with the dividend announcement made at the meeting. Some consolation is derived from the index figures published last week, which are taken to indicate the possibility of improvement during the second half of the present year. Globe Telegraph preference at 11¾ are ⅛ higher. There has also been further inquiry for Great Northern Telegraph. Negotiations are on foot having for their object an addition to the Great Northern's landing licences in England.

Manufacturing and Equipment

The good showings made by the British Insulated, Callender's, Henley's, General Electrics and some of the other construction companies are having their natural effect upon the prices of the companies' shares. British Insulated have risen to 70s., Callender's to 62s. 6d., Enfields to 86s. 3d., Henley's to 127s., public attention having been directed to a group which for some time past has been somewhat overlooked in the search for first-rate industrials. The yield on the money to be obtained by investment in such shares at the present prices is now comparatively small, but the present buyers fix their hopes upon an early future in which dividends shall be advanced, and yields, of course, correspondingly increased.

Ever-Ready shares have rallied to 27s. 6d. Ferranti preference improved to 24s. 3d.xd. India Rubber ordinary at 3s. 9d., and the preference at 10s. are again better. The list as a whole shows notable strength, and the fact of there being no more than a meagre floating supply of shares has a marked effect upon prices when the buyers come along.

Electricity Supply Shares

Prices in the electricity supply market are easier for choice, as the Stock Exchange says. What few changes have taken place are downward, so far as the London and the provincial shares are concerned. Something of a feature in the colonial market is a rise of 1s. 9d. in Victoria Falls ordinary shares. The company has declared a bonus of 5 per cent. in addition to the usual 12 p.c. final dividend. This makes 20 per cent. for the year. The preference shares will receive 10 per cent., and the price is 39s. 6d. The company has the right to pay off the preference shares at 20s. in 1950, upon giving two years' notice. Of the Indian shares, Calcutta Electrics at 46s. 6d. are ⅛ down, and amongst foreign issues, Tokyo Electric sixes are better at 77.

"Atkin's Manual"

A new edition of "Atkin's Manual" has just been published, and makes a handsome addition to the series. The book is wonderfully well done. Its pages deal with almost every known company connected with electricity supply. The information is set out in so lucid a method that the financial position of the securities can be seen at a glance. The "Manual" is compiled by a leading firm of dealers in the Stock Exchange, and the comprehensive subject-matter is presented with admirable skill.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, June 27.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	72/6	—	4 2 4
Brompton Ordinary	1	8½	7	32/6	—	4 6 2
Central Electricity 4½% Deb.	Stock	4½	4½	105	—	4 5 9
Charing Cross Ordinary	1	8d	7	33/0	—	4 4 10
Chelsea	1	8½	7	32/6	—	4 6 2
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	35/–	—	4 0 0
County of London	1	10½	10½	52/6	—9d.	4 0 0
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	43/3	–¼	4 3 4
Elec. Supply Corporation	1	11	11	64/6	–	3 8 4
Kensington Ordinary	1	8	7	33/–	—	4 4 10
Lancs Light and Power	1	7	7	31/3	—	4 9 7
London & Home Counties 4½%Deb.	Stock	4½	4½	109	—	4 3 4
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	49/6	–	4 1 0
Midland Counties	1	7	7	35/–	—	4 0 0
Mid. Elec. Power	1	8	8	36/3	–¼	4 8 4
North Eastern Electric Ordinary	1	6	6	30/–	—	4 0 0
Do. 7% Pref.	1	7	7	32/–	—	4 7 6
Northampton	1	10	10	50/–	—	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	28/6	–	4 4 3
St. James' and Pall Mall	1	8	7	32/–	—	4 7 6
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/–	—	4 4 10
Urban Ordinary	1	7	7	37/6	—	3 14 8
Westminster Ordinary	1	8½	7	32/6	—	4 6 2
Whitehall Elec. Invst. 7¼% Pref.	1	7½	7½	20/9	—	7 4 7
Yorkshire Elec.	1	8	8	42/6	—9d.	3 15 3
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	90	—	4 9 0
Metropolitan	„	2½	1⅛	73	+1	2 4 6
Do. District	„	4½	3	69½	—	4 6 4
Underground Electric	1	7	4½	23/6	+1/6	3 16 7
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	152½xd.	—6	5 18 0
Anglo-Am. Tel. Pref.	Stock	6	6	106	—	5 13 2
Do. Def.	„	1½	1½	23½	—	6 7 8
Cables & Wireless 5½% Pref.	„	2¾	2¾	76½	—	3 12 0
Do. A 7½% Ord.	„	Nil	Nil	26½	—	—
Do. B Ord.	„	Nil	Nil	12	–½	—
Globe Tel. and T. Ord.	10	Nil	2½	10¾xd.	–½	2 6 5
Do. do. Pref.	10	6	6	11¾xd.	+⅛	5 2 2
Great Northern Tel.	10	20	20	29½	+½	6 15 6
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	2⅜	—	*4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	14½	—	—
British Electric Traction Def. Ord.	„	5	5	365xd.	—6	—
Do. do. Pref. Ord.	„	8	8	135xd.	+3	5 18 5
Brazil Traction	100	—	—	17	–1½	—
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	19/–	—	—
London United Tram Deb.	Stock	4	4	72¼xd.	–1½	5 10 4
Mexico Trams, 5% Bonds	—	5	5	38½	+2	12 19 8
Mexican Light Common	100	Nil	Nil	14½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	70½	+5	7 1 10
Victoria Falls Ord.	1	15	20	86/3	+1/9	4 12 7
Yorkshire (West Riding)	1	Nil	Nil	9/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	17/6	—	4 11 5
Do. Pref.	1	8	8	28/3xd.	+6	5 13 3
Babcock & Wilcox	1	14	9	33/9	—9d.	5 6 8
British Aluminium Ord.	1	5	5	28/3	—	3 10 10
British Insulated Ord.	1	15	15	70/–	+½	4 5 9
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	3½xd.	+⅛	4 16 0
Do. 6½% Pref.	1	6½	6½	28/9xd.	+6d.	4 10 5
Crompton Parkinson Ord.	5/–	22½	—	17/6xd.	+3d.	6 8 7
Do. 8% Pref.	1	8	8	28/5xd.	+6d.	5 11 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½xd.	+1½	4 17 7
Electric Construction	1	Nil	Nil	12/6	—	—
Enfield Cable Ord.	1	25	25	4⅛	+¼	5 15 9
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	12/6	—	—
Ever Ready	5/–	35	35	27/6	+9d.	6 7 3
Ferranti Pref.	1	7	7	24/3xd.	+3d.	5 15 6
G.E.C. Pref.	1	6½	6½	29/0	—	4 9 8
Do. Ord.	1	8	8	43/9	—	3 13 9
Henley's	1	30	30	6½	+⅛	4 14 6
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	8/9	+6d.	—
Johnson & Phillips	1	5	5	18/3	—	5 9 7
Siemens Ord.	1	7½	6½	23/9	—	5 9 5
Telegraph Construction	£1	Nil	Nil	18/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

24603. "Electric gaseous discharge lamps." Claude-Lumière Soc. Anon. pour les Application des Gaz Rares á la Lumière, Procedes G. Claude. February 19th, 1931. (393308.)
30346. "Electric meters." Allgemeine Elektricitäts-Ges. November 1st, 1930. (393310.)
32429. "Systems of electric drive for winding-up paper or similar material." International General Electric Co., Inc. November 22nd, 1930. (393299.)
32692. "Engine electric transmission systems for vehicles." Sir W. G. Armstrong, Whitworth & Co. (Engineers), Ltd., and C. M. Beckett. November 25th, 1931. (393311.)
32708. "Power current sending plant for transmitting and distributing electric energy through open or built over space." J. Kolarz. December 23rd, 1930. (393273.)
32965. "Electric power cables." H. Sonnenfeld. December 13th, 1930. (393292.)
33133. "Light signals." Westinghouse Brake & Saxby Signal Co., Ltd. January 8th, 1931. (393281.)
33187. "Magnet cores for use in loading coils or the like." Automatic Electric Co., Ltd., and P. N. Roseby. November 30th, 1931. (393287.)
33189. "Telegraph systems." Automatic Electric Co., Ltd. November 28th, 1930. (393288.)
33445. "Manufacture of thermionic valve pins and like metal tubular elements." G. Gottlieb. December 2nd, 1931. (393315.)
33460. "Thermionic amplifiers." Marconi's Wireless Telegraph Co., Ltd., and R. B. Armstrong. December 2nd, 1931. (393318.)
34053. "Electrical signalling systems." Automatic Electric Co., Ltd., T. B. D. Terroni, and G. D. Turton. December 8th, 1931. (393327.)
34518. "Protective devices for use with potential transformers." T. B. Somerville and Associated Electrical Industries, Ltd. December 12th, 1931. (393335.)
35447. "Telephone cables." Siemens Bros. & Co., Ltd., and A. Rosen. December 22nd, 1931. (393342.)
35686. "Radio distance determining system and apparatus." E. G. Gage. December 26th, 1930. (393344.)

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424. "Methods of controlling the speed of electric motors." British Thomson-Houston Co., Ltd. January 7th, 1931. (393347.)
638. "Electric totalisator systems." Siemens Bros. & Co., Ltd., J. H. Broome, and R. I. H. Clark. January 8th, 1932. (393348.)
3257. "Electric telegraph and like systems." E. H. Jolley and J. A. S. Martin. February 3rd, 1932. (393359.)
3575. "Thermionic valves or electron-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 31st, 1931. (393362.)
3921. "Electric selective switching apparatus." L. D. Blyth and L. B. Juby. February 10th, 1932. (393366.)
4451. "Electric motor control systems." International General Electric Co., Inc. February 14th, 1931. (393371.)
4563. "Overhead conductor crossing for electric traction systems." F. Morris. February 16th, 1932. (393372.)
5385. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. February 23rd, 1932. (393376.)
5832. "Method for modulating high-frequency transmitters." General Electric Co., Ltd., and R. Le Rossignol. February 26th, 1932. (393379.)
6437. "Moving-coil loud speakers." Igranic Electric Co., Ltd., and L. H. Paddle. March 3rd, 1932. (393382.)
9366. "High-frequency coupling units for use in wireless receiving apparatus." Ward & Goldstone, Ltd., and V. G. Van Colle. April 1st, 1932. (393392.)
9761. "Battery hand lamp." Burgess Battery Co. April 23rd, 1931. (393395.)
10685. "Electromagnetic relay for conversion of electric energy." H. Rosenkilde. April 14th, 1931. (393398.)
11999. "Methods for the production of thermo-couples." L. Mellersh-Jackson (Siemens Planiawerke Akt.-Ges. für Kohlefabrikate). April 26th, 1932. (393403.)
12128. "Wireless installation with one or more loud speaker telephones specially separated from the receiving and amplifying set." British Goldring Products, Ltd. January 29th, 1932. (393405.)
13656. "Electrical switches of the push-and-pull type." H. G. Baggs. May 12th, 1932. (393409.)
15956. "Receivers for modulated high-frequency waves." Telefunken Ges für Drahtlose Telegraphie. June 6th, 1931. (393415.)
16830. "Photo-electric cells." Naamlooze Venootschap Philips' Gloeilampenfabrieken. November 20th, 1931. (Addition to 343930.) (393418.)
19108. "Radiography." I.G. Farbenindustrie Akt.-Ges. July 7th, 1931. (393426.)
20323. "Dynamo-electric machines." C. W. Noel. July 16th, 1931. (393430.)
23310. "High-frequency transmission systems for railway signalling." British Thomson-Houston Co., Ltd. August 20th, 1931. (393440.)
23578. "Distance relay for electrical supply networks." Allmanna Svenska Elektriska Aktiebolaget. August 24th, 1931. (393442.)
23583. "Electro-magnetic extra air valves for internal-combustion engines." J. D. Butler. August 23rd, 1932. (393443.)
27948. "Automatic electrical circuit breakers." A. West & Co., Ltd., and R. A. R. Bolton. October 7th, 1932. (393458.)
28647. "Dynamo-electric machines." Westinghouse Electric and Manufacturing Co. November 11th, 1931. (393466.)
29513. "Light-sensitive devices." British Thomson-Houston Co., Ltd. October 23rd, 1931. (393471.)
29751. "Radio receivers." Telefunken Ges. für Drahtlose Telegraphie. October 24th, 1931. (393472.)
30386. "Mercury switches." A. Garbarini. October 31st, 1931. (393478.)
30684. "Torch batteries." G. Jager. October 31st, 1932. (393479.)
31403. "Contact-breakers for ignition magnetos." Fabrica Italiana Magneti Marelli. November 7th, 1931. (393481.)
32577. "Electrical coupling arrangements for use at high frequencies." Telefunken Ges. für Drahtlose Telegraphie. November 17th, 1931. (393490.)
33171. "Thermionic valve circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. November 23rd, 1931. (393495.)
33287. "Remote measuring apparatus." International General Electric Co., Inc. November 24th, 1931. (393497.)
33586. "Signal means for regulating road traffic." R. Jaques. November 28th, 1932. (393500.)
33628. "Illuminating systems for vehicles." L. Ramseyer-Pitelle, H. Richard, F. Ramseyer, and A. Treier. February 23rd, 1932. (393501.)
34955. "Electrical heating elements and the manufacture of the same." J. L. Musgrave, R. Grierson, and R. Crittall & Co., Ltd. December 1st, 1931. (Patent of addition not granted.) (Divided application on 33263/31.)(393304.)
35978. "Luminous electric discharge tubes." General Electric Co., Ltd. December 23rd, 1931. (393515.)
36202. "Single-phase induction motors." English Electric Co., Ltd., and R. D. Ball. December 21st, 1932. (393518.)
36781. "Thermionic amplifiers." Telefunken Ges für Drahtlose Telegraphie. December 29th, 1931. (393520.)

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1374. "Thermostat devices controlling the correct position of a source of radiation, especially of the arc of an arc lamp." C. Zeiss. January 22nd, 1932. (393530.)
2431. "Electric welding apparatus." International General Electric Co., Inc. January 26th, 1932. (393536.)
2792. "Fans driven by an electric motor." G. Ducart. January 28th, 1932. (393541.)
3458. "Electric terminals." N. Allday and R. Bain. February 4th, 1933. (393544.)
4364. "Electrical fuse distribution boards." English Electric Co., Ltd., and A. M. Pooley. February 13th, 1933. (393549.)
4848. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. February 16th, 1932. (393550.)
6133. "Thermionic amplifiers." Telefunken Ges für Drahtlose Telegraphie. February 29th, 1932. (393553.)
8967. "Mercury tube switches." Siemens-Schuckertwerke Akt.-Ges. March 24th, 1932. (393556.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 21st:—

The Goblin Wizard Electric Cleaner (lettering and design). No. 534242. Class 6. Suction cleaning machines.—British Vacuum Cleaner & Engineering Co., Ltd., Parson's Green Lane, Fulham, S.W.6.

Vertex. No. 534570. Class 6. Electrical distributors and contact breakers, being parts of magnetos for internal-combustion engines, magnetos, dynamos, electric starting and ignition machinery, &c. No. 534582. Class 13. Cable thimbles, sparking plugs, junction and terminal boxes, electric switches and electric lamps (ordinary), &c.—Scintilla Gesellschaft, Solothurn, Switzerland (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2).

Ever Ready. No. 534599. Class 8. Dry batteries and cells and accumulators (not for medical purposes). No. 534600. Class 11. Lamps, dry batteries and cells, accumulators and coils, all electrical, and all for medical or dental purposes. No. 534601. Class 13. Electric lamps, electric lamp and torch cases, electric switches and bells. No. 534602. Class 14. Nickel-plated electric lamp cases.—Ever-Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

Marconi. No. 537489, also G. Marconi (lettering and design). No. 537493, both Class 8. Thermionic valves for use with radio transmitting apparatus, radio receiving apparatus for use in communications for tolls, and with radio receiving apparatus, forming part of the equipment of ships and aircraft primarily intended for navigational purposes, all being valves that are supplied by the constructors of the said apparatus either directly or indirectly, but not through retail shops, to the purchaser or user.—Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C.2.

Marconi. No. 537492; also G. Marconi (lettering and design), both Class 8. Thermionic valves for use in radio receiving sets for broadcast reception by the public and offered to the public only through retail shops as parts of such apparatus or separately.—Marconiphone Co., Ltd., Blyth Road, Hayes, Middlesex.

Imp. No. 538815. Class 8. Loud speakers, radio apparatus, and radio-gramophones.—Ultra Electric Co., Ltd., Erskine Road, N.W.3.

Traffolyte. No. 541173. Class 50. Synthetic resin sold in sheets and articles made therefrom.—Metropolitan-Vickers Electrical Co., Ltd., Bush House, Aldwych, W.C.2.

Cinema Lighting at Douglas

A complete new lighting installation has recently been carried out at the Picture Theatre, Douglas, I.O.M., which has been considerably enlarged. Decorative glass fittings have been fixed to the ceiling and walls, and an effective colour scheme has been introduced. Round the proscenium arch are concealed white, red, green and amber lamps arranged on a four-colour lighting circuit which is dimmer controlled. The whole of the electric lighting fittings were manufactured and supplied by the General Electric Co., Ltd., and installed by the Bective Electrical Co., Ltd.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Addiscombe.—Showrooms, shops and flats, Lower Addiscombe Road; A. D. Robinson.

Ayrshire.—Extensions, Heathfield Public School, Ayr (electrical work); W. Reid, architect, 14, Wellington Square, Ayr.

Barking.—School (760 places), Becontree; C. J. Dawson, architect, Clock House Chambers.

Birmingham.—Conversion of premises, 74, Edmund Street, into all-electric restaurant; Maddocks & Walford, builders, Tyburn Road.

Blackburn.—Extensions to works of Scapa Dryers, Ltd., Witton; E. Lewis & Son, builders, Shorrock Delph.

Blackpool.—Houses, Marlborough Avenue and Winifred Avenue; Greenhalgh & Levine.

Bournemouth.—Shops and flats, Westover Road and Albert Road; A. J. Seal, architect, Yelverton Road.

Bradford.—Reconstruction and extension of police headquarters, Town Hall (£4,000); city architect.

Bridlington.—Houses (32), South Back Lane Estate; borough surveyor.

Brierley Hill (STAFFS).—Houses (48), Hawbush Road; U.D.C. surveyor.

Bromsgrove.—Extensions, Cottage Hospital, with electrical installation (£3,000); J. & A. Brazier & Co., builders, Worcester Road.

Canterbury.—Extensions, Beaney Institute (£2,750); H. M. Enderby, city surveyor.

Carlisle.—Police station and courts (£45,000); H. Redfern, architect, 2, Queen Anne's Gate Buildings, London, S.W.1.

Cheadle (STAFFS).—Houses (27), Folly Lane, Cheddleton, for H. Gilbert.

Croydon.—Houses (47), Beech Road; Reith & Co. Houses (40), Brampton Road; F. H. Willcocks. Houses (66), Colin Close; Gower Builders, Ltd. Bath filtration plant (£4,500), Scarbrook Road; borough engineer.

Cupar (FIFESHIRE).—Houses (£7,335); burgh surveyor.

Darlington.—Extensions, Arthur Pease School; Joseph Potts & Son, architects, 57, John Street, Sunderland.

Deal.—School, Mill Road (£11,052); W. W. Martin, contractor, Ramsgate.

Dudley.—Ten shops and flats, New Street (£13,787); C. Coulson, builders, Stafford Street.

Dundee.—Nursery school (£2,000); city architect.

East Riding.—School (320 places), Withernsea; county architect, County Hall, Beverley.

Eccles (LANCS).—Schools (960 places), Sutherland Street; director of education.

Essex.—Schools, Marsh Green, Dagenham; J. Stuart, county architect, Chelmsford.

Falkirk.—Reconstruction of Grand Theatre (£20,000) for the Associated British Cinemas; C. I. McNair, architect, Glasgow.

Fort-William (INVERNESS-SHIRE).—R.C. church (£18,000); R. Fairlie, architect, 7, Ainslie Place, Edinburgh.

Gateshead.—Drapery premises, High Street, for Doggarts, Ltd.. Bishop Auckland (£30,000).

Glasgow.—Houses (922), Blackhill, and police garage, central station (£6,000); trade contractors. Aerodrome buildings, Renfrew Air Port; Scottish Flying Club, Ltd. Cinema, offices, &c., for Paramount Pictures, Renfield Street; J. C. Graham, managing director. Shops, Paisley Road; Galbraiths Stores, Ltd. Alterations and additions to Southern General Hospital, Linthouse; city architect. Enlargement of St. John's Girls' School, Tradeston Street (£7,550); education director.

Grimsby.—School, Carr Lane, for E.C. (electrical installation); W. Ellis, architect, Prudential Chambers, Victoria Street. Casual ward extensions (£3,000); borough engineer.

Harrow Weald.—Houses (26), Belsize Road; H. B. Silver, Ltd., contractors, Harrow.

Haydock.—Houses (80); H. Horridge, builder, Earlstown.

Hebburn-on-Tyne.—Conversion of houses into shops, Victoria Road, and shops into houses, Carr Street; S. Oakes, builder, Station Road.

Hertford.—Houses (46); Capt. Elliott, architect.

Hertfordshire.—School (434 places), Welwyn Garden City; A. E. Prescott, county surveyor, Hatfield.

Hove.—Rebuilding hospital (£25,000) with X-ray department; J. G. Oatley, architect.

Howdon-on-Tyne (NORTHUMBERLAND). — Houses (160); A. Lisle, builders, Whitley Bay.

Ince-in-Makerfield (LANCS).—Houses (54), Higher Ince; W. Thornley, U.D.C. architect, 46, Wallgate, Wigan.

Irish Free State.—(CORK).—Houses (32), Bishop's Field, for St. Mary's Utility Society, St. Mary's Hall; J. R. Boyd-Barrett, chartered architect, 61, South Mall.

Jarrow-on-Tyne.—Houses (100); J. S. Weir, borough surveyor. Municipal hall; borough engineer.

Kent.—Extensions, Medway Hospital, Chatham, with operating theatre (£38,500); county architect, Maidstone.

Kilmarnock.—Swimming baths (£20,000); burgh surveyor.

Kingston-on-Thames.—Houses (30); borough surveyor.

Lemington-on-Tyne.—Cinema and shops; Mr. Charlton, builder.

London.—(ACTON).—Four shops and houses, Willesden Lane; Davis & Knight, architects, 93, Mortimer Street, W.1. (BATTERSEA).—Latchmere bath improvements and filtration plant (£10,000); borough engineer. (BROCKLEY).—School (1,000 places), Honor Oak Housing Estate, for London E.C.; clerk. (EALING).—Houses (29), Perimeade Road; G. L. Russell, architect, Broad Street Buildings, Liverpool Street, E.C. Houses (22), Rydal Crescent; R. Lancaster & Sons, 30, Ealing Road, Wembley. Ten shops and offices, The Broadway; T. Brammall Daniel, architect, 36, Victoria Street, S.W.1. (HACKNEY).—Town hall, Hackney Grove; Messrs. Josephs, architects. (ISLINGTON).—Extensions, St. Mary's Hospital (£6,589); Ashford Builders Co. (LEE).—Houses (145), Manor Lane Estate; H. F. Thoburn, Ltd. (LEWISHAM).—Houses (152), Bramdean Gardens; Chart, Son, & Reading. Houses (85), Sevenoaks Road; H. Macintosh. (STOKE NEWINGTON).—Houses, Lordship Road; G. K. Codrington. Flats, Lordship Terrace; Howes & Jackson, architects, 10, Gray's Inn Place, W.C.1. (TOTTENHAM).—Houses (91), Devonshire Hill Estate; G. Reed & Sons, Ltd. Houses, Weir Hall; bath and dance hall, Lordship Lane; library, White Hart Lane; and extension of town hall; U.D.C. surveyor. Factory, West Road; E. G. Brown. Factory, Willoughby Lane; Raven Confectionery, Ltd. (WESTMINSTER).—Flats, Pulford Street, for the Housing Trust; H. Brown, contractor, The Eagles, Harrow Weald Park. Additions to Westminster Theatre, Palace Street; Smith & Brewer.

Market Deeping.—Cinema for W. V. T. Snow, 74, Eastfield Road, Peterborough (electrical installation).

Newcastle-on-Tyne.—Houses (94), St. Anthony's Estate; R. E. Roberts, housing architect, 18, Cloth Market. Houses (60), Whickham View, Benwell; S. Moore, builder, Fenham. Additions to Tankersville Terrace High School; H. Waller, builder, Waller Street.

Paignton.—Aerodrome; K. D. MacGregor-Bowron. Estate development, Preston Down Road; Gt. Western Building Corporation. Additions, Croft Hotel, Hyde Road; R. C. Farmer. Additions, Goodrington House Hotel, Tanners Road; Addison Café Co.

Prescot (LANCS).—Council offices (£8,500); U.D.C. surveyor.

Rawtenstall.—Houses (50); borough engineer. Extensions, Laceclough Works; Calico Printers Association, Ltd.

Renfrew.—Factory for Paragon Food Products Co., Ltd.; the Manager, Berwick Drive, Cardonald.

Rotherham.—Houses (150); R.D.C. surveyor.

Royston (CAMBS).—Cinema for J. N. Cox.

Sanderstead.—Houses (47), Braemar Avenue; F. H. Willcocks.

Selsdon.—Three shops, Addington Road; C. H. Ridge.

Somerset.—Schools, Weston-super-Mare (£51,450) and Timsbury (£13,275); director of education, The Boulevard, Weston-super-Mare.

Southend-on-Sea.—Extensions, Rochford Institution (£5,600); borough surveyor.

Southport.—Ballroom, Kingsway; George Rose. Additions to children's ward, Infirmary; Board of Management.

South Shields.—Houses (68), Mortimer Avenue and Banbury Terrace; Henderson Bros., builders, Smith Street, Tyne Dock. Alterations and additions to Hindell's Dairies, Ltd., Empress Street; Carruthers & Sons, builders, 1, Heugh Terrace.

Standish-With-Langtree (LANCS).—Houses (32); U.D.C. surveyor.

Sunderland.—Radiological block, Royal Infirmary (£10,000); R. Stafford & Sons, builders, 5, Rudland Terrace. School, Ford Estate; O. T. Marks, education architect, John Street.

Surrey.—Schools, Caterham Hill (280 places), Sanderstead, for County E.C.; W. W. Finny, secretary, Kingston-on-Thames.

Thornton Heath (SURREY).—Houses (28), Stanford Road; Truett & Steel, Ltd.

Todmorden.—Houses (54), Ashenhurst Estate; borough engineer.

Wallasey.—Clinic, Mill Lane (£2,950); Lloyd & Cross, Ltd. Grandstand, &c., Leasowe Road; New Brighton Rugby Football Club. School, Douglas Drive, for E.C. Improvements, New Brighton Tower; G. Strafford, New Brighton Amusements, Ltd.

Watford.—Houses (76), Leavesden Green Estate; Watford Gardens Estate Co. Development of Faircross Estate; David Greenhill, director, Ideal Homes, Ltd. Development of Russells Estate; Percy Harvey (Sales), Ltd.

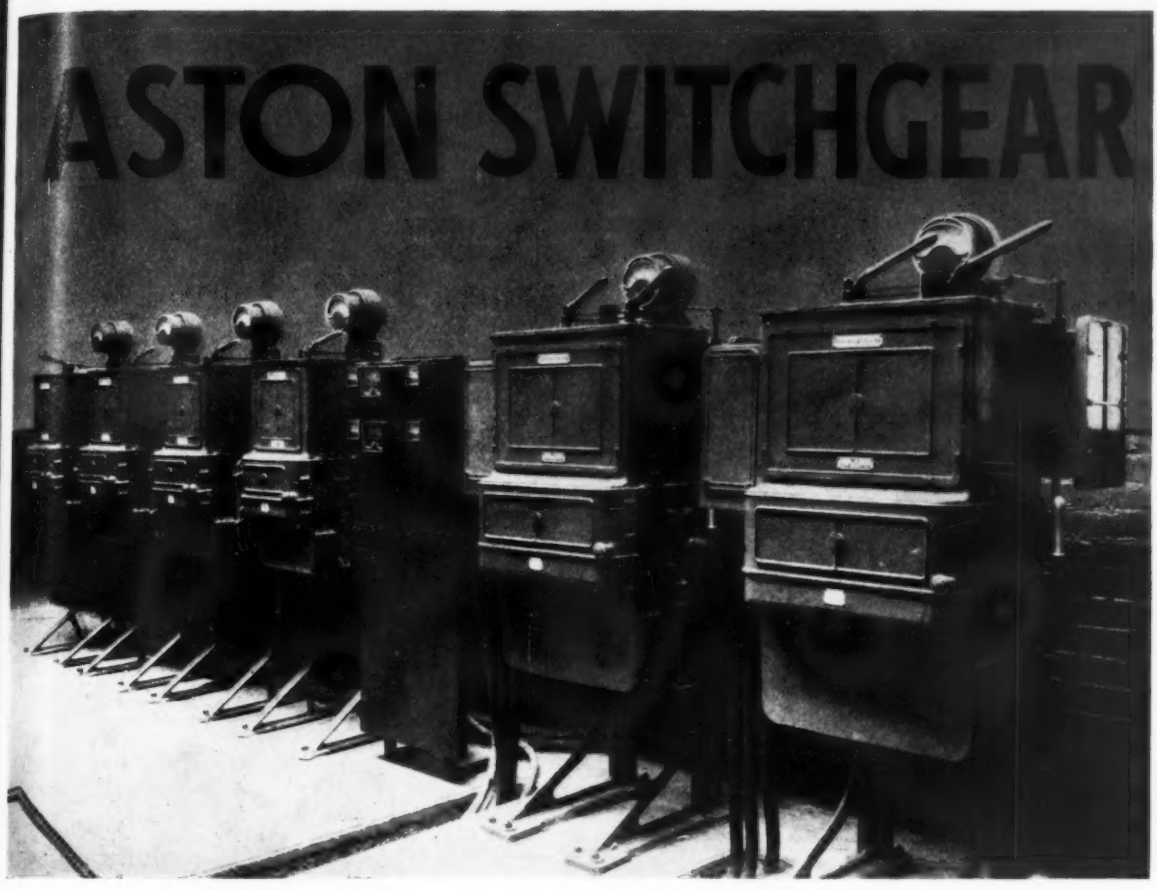
Wednesbury.—Houses (172); A. C. S. Teece, Ltd., builders.

Windsor.—Houses (76), Vale Road, for F. P. Scott & Co.

Worsborough (YORKS).—Houses (30); U.D.C. surveyor.

Electricity Supply in Canada

ACCORDING to the Canadian Census of Industry, just received, the output in 1931 of all generating stations in the Dominion (307 water, 252 fuel) was 16,331 million kWh (16,025 million from water), a decrease of 9.7 per cent. compared with 1930; deducting energy produced for export (1,227 million kWh), the decrease was 8.4 per cent. The h.p. of water turbines installed in 1932 was 7,045,000 and the potential h.p. available for twenty-four hours at ordinary minimum flow (80 per cent. efficiency) was 20,347,000. Electricity consumed in 1931 was 15,101 million kWh, or 1,170 kWh per consumer. Flat rates of $2 per kW per month were charged for water heaters in Winnipeg, where 3,610 kWh was the average consumption per domestic consumer. In most municipalities in Ontario (1,497 kWh per consumer) all electricity for domestic use is measured through one meter on block rates going down to 0.9 cent. or less. The average revenue per kWh for domestic service for all Canada was 2.25 cents as compared with 5.78 cents. in the U.S.A., Manitoba being lowest with 1.04 cents. Pulp and paper mills purchased 5,166 million kWh (one-third of their total requirements) from the public mains. Electric boilers had a rated capacity of 883,450 kW and consumed 2,032 million kWh; the Canadian Car and Foundry 5,000-kW boiler raising steam for process work. The Ste. Justine Hospital boiler, of 2,500 kW capacity, provides steam for use in connection with the hospital's laundry, sterilising, cooking, heating, &c. Both boilers operate twenty-four hours daily during the six summer months and twelve night hours in winter. The total capital invested in 1931 was £1,092 million, of which generation accounted for £735 million, transmission for £194 million, and distribution for £100 million.



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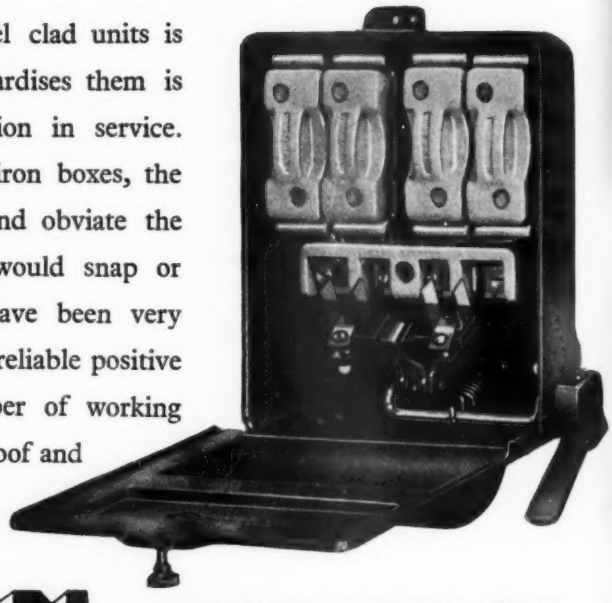

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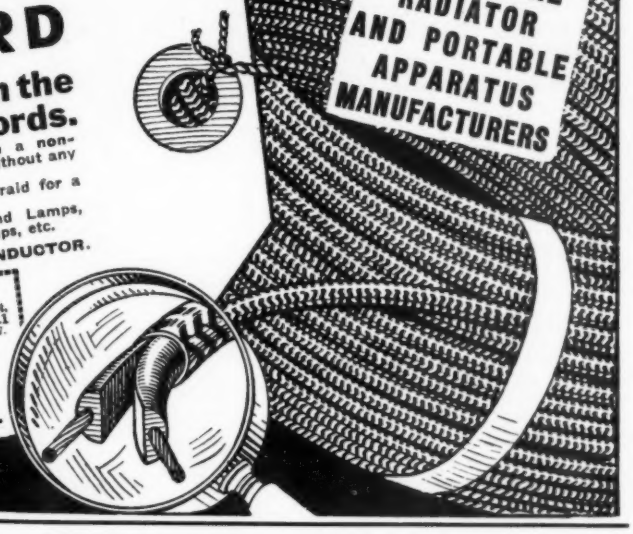

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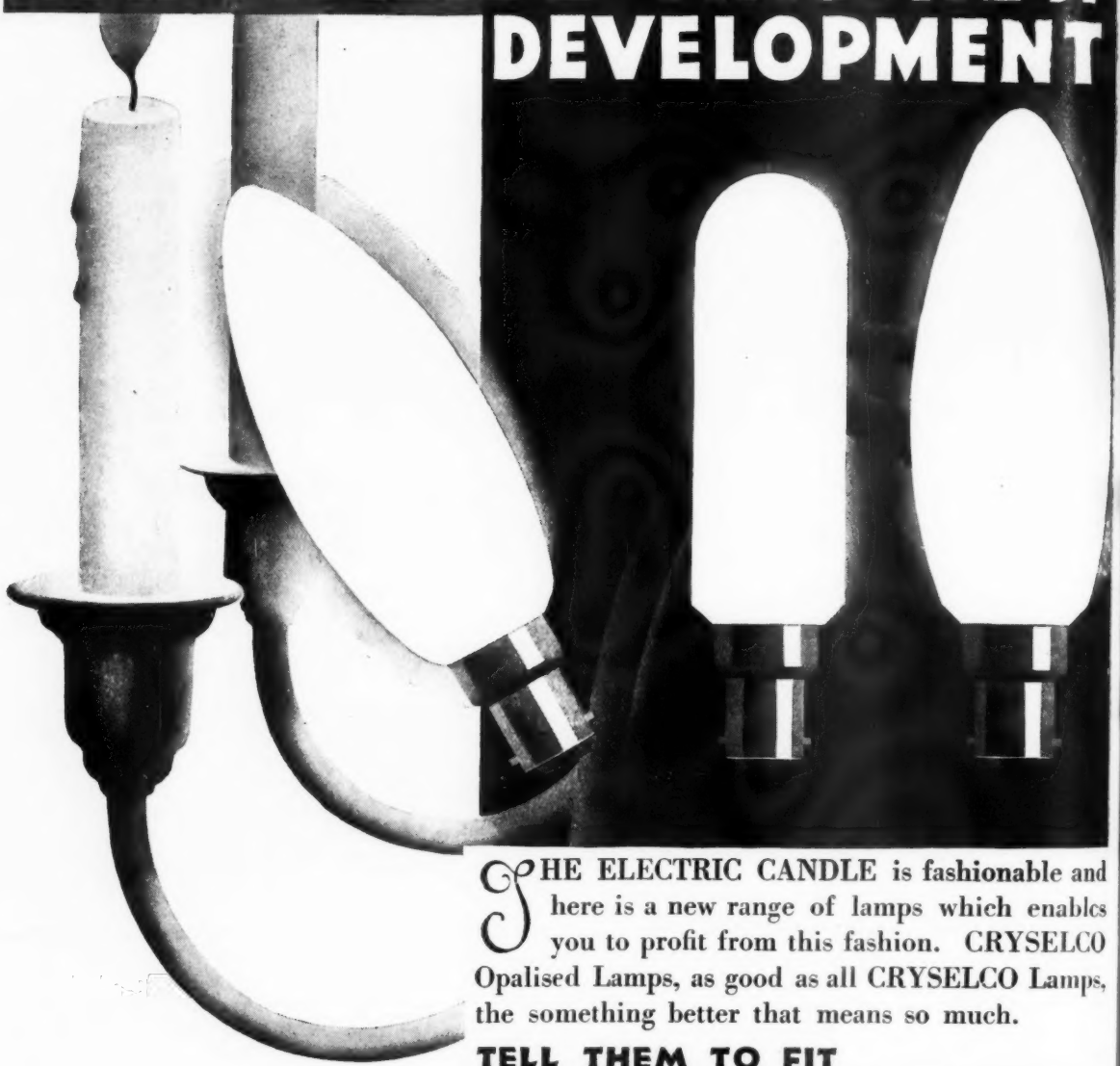

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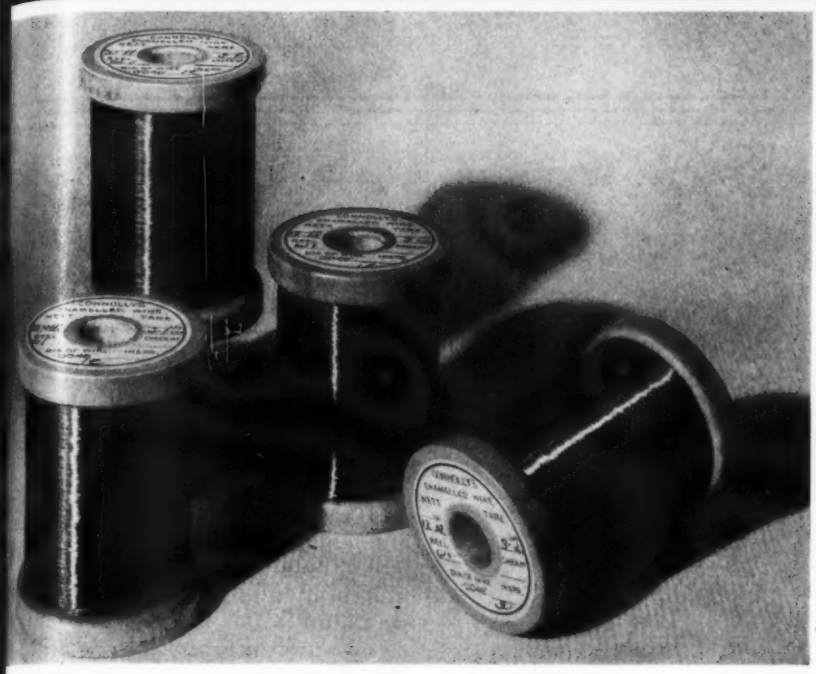

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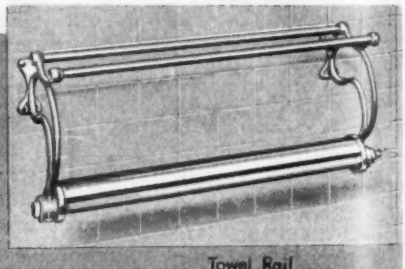

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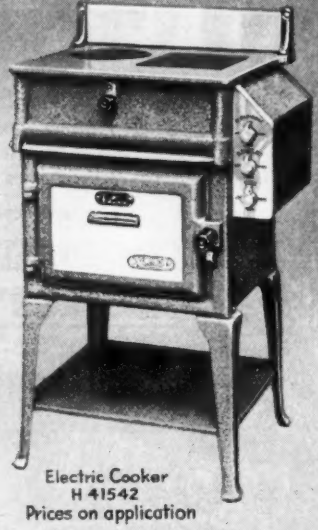

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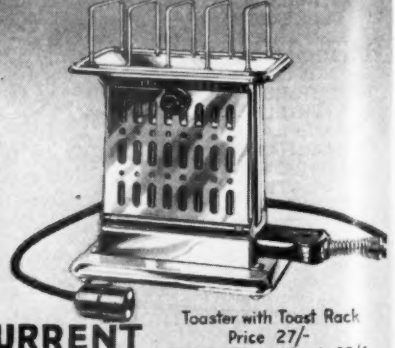

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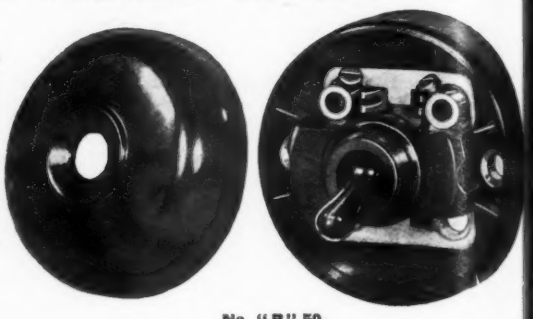

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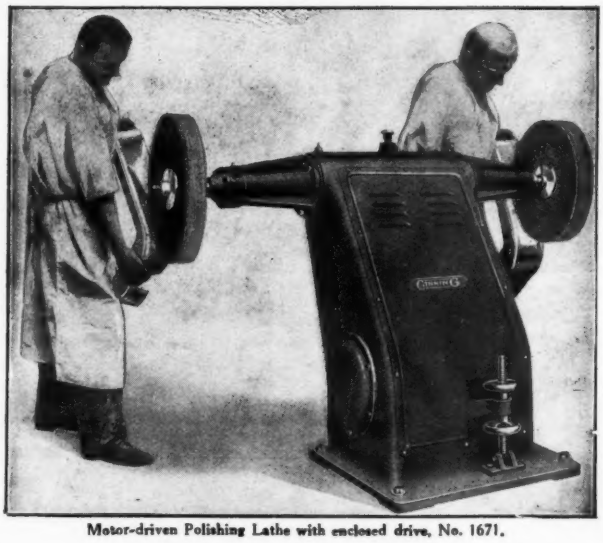

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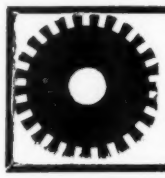

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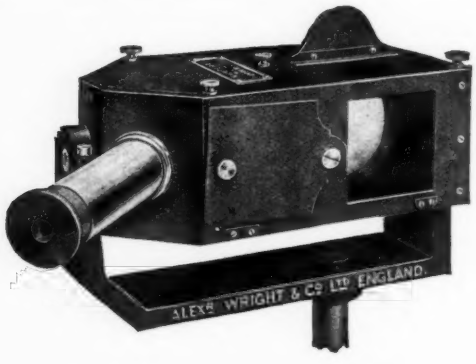

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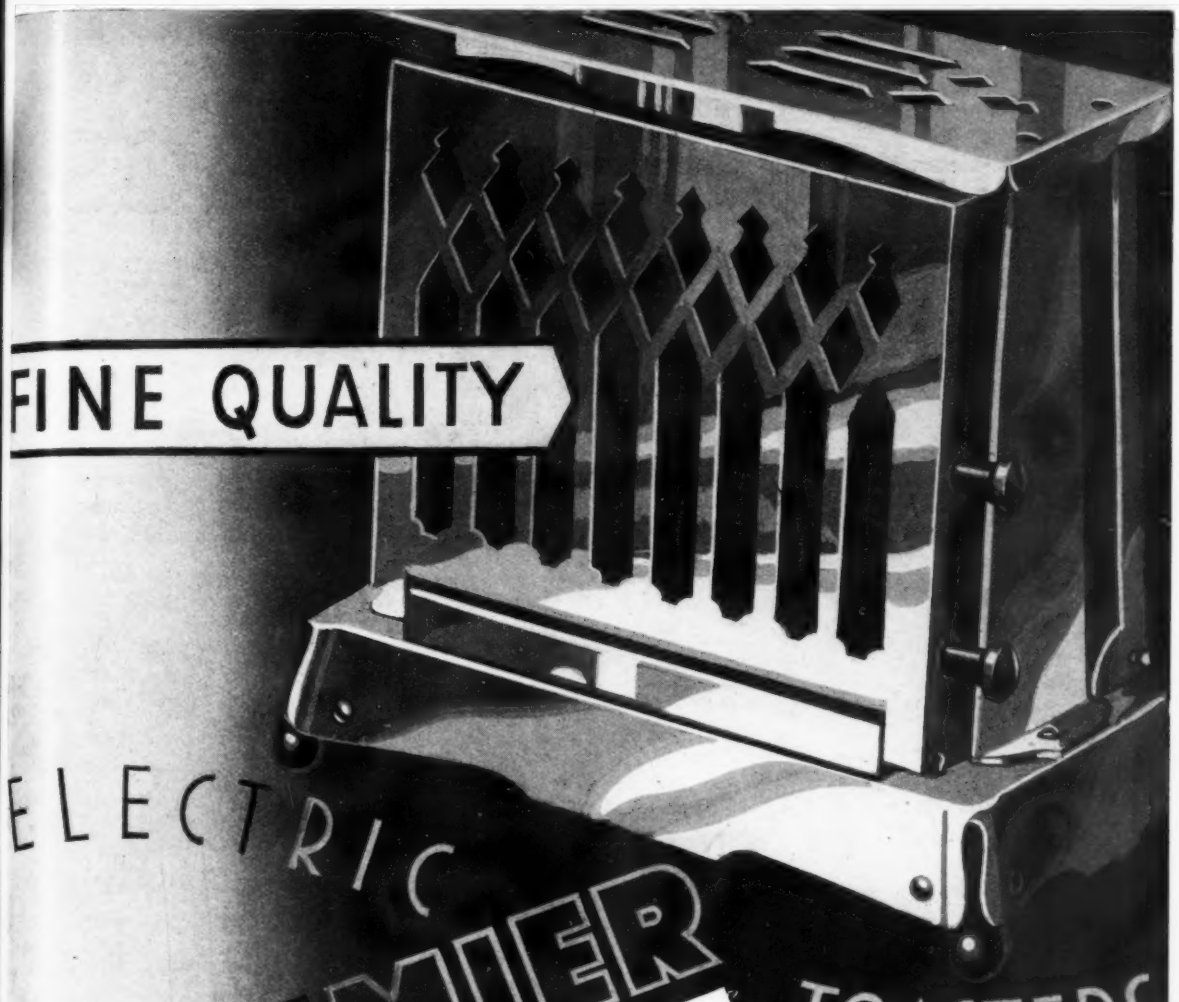

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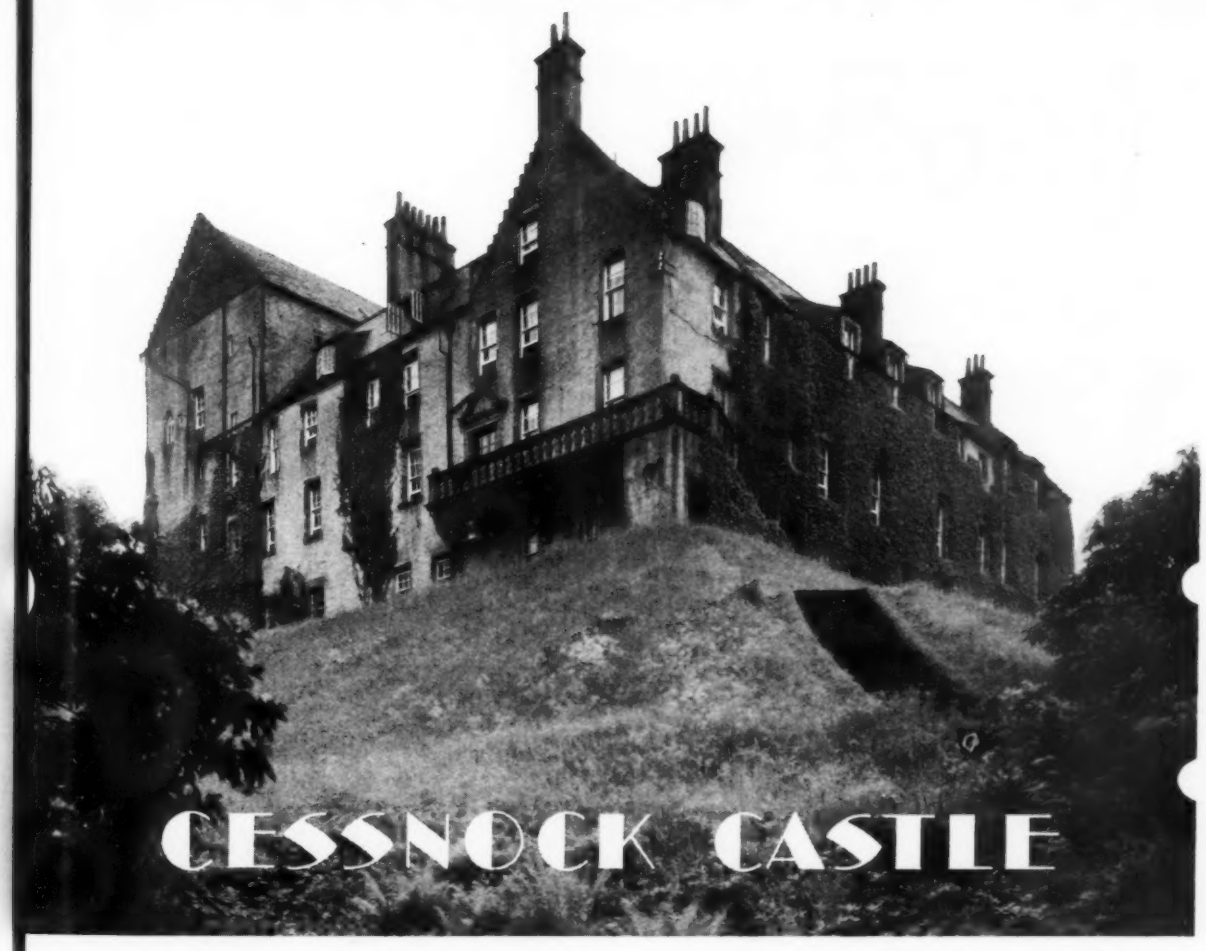

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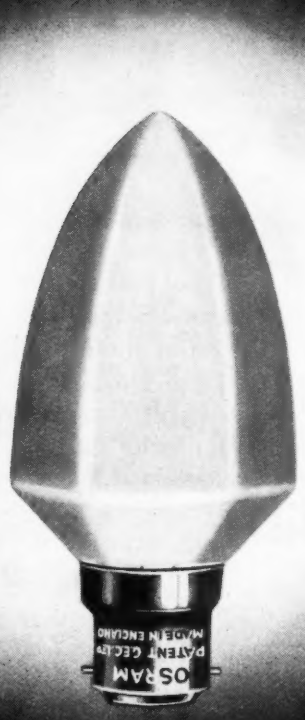

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ONE OF THE Osram SPECIALISED LAMP SERIES

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

CLASSIFIED ADVERTISEMENTS

Prepaid Advertisements are taken to appear under the heading Situations Vacant or Situations Wanted at the rate of one penny a word (minimum 1s.). Three consecutive insertions can be secured for the price of two, when these are ordered and prepaid with the first insertion. A box number and the "Electrical Review" address count as seven words.

Original Testimonials should never be sent with applications.

In the case of replies to Situations Vacant, if any reply is not to be delivered to any particular firm or individual, if instructions to that effect addressed to the Manager of the "Electrical Review" accompany the reply, he will do his best to carry out such instructions. Letters of applicants in such cases cannot be returned to them. In no case will the name of an advertiser using a box number be disclosed.

Advertisements other than Situations Vacant and Situations Wanted, 1s. 9d. per line (14s. per inch) per insertion.

Advertisements for Classified Columns must reach us by 5.30 p.m. on Tuesday.

SITUATIONS VACANT.

URBAN DISTRICT COUNCIL OF LONG EATON.

Electricity Undertaking.

APPOINTMENT OF ELECTRICAL ENGINEER AND MANAGER.

THE Urban District Council of Long Eaton invite applications for the position of Electrical Engineer and Manager of their Undertaking.

Applicants must be prepared to satisfy the Council as to their organising ability and business capacity.

The commencing salary will be at the rate of £675 per annum, rising by annual increments of £25 as described in the terms and conditions of appointment.

Applications must be made on the prescribed form, and these, duly completed and accompanied by three recent testimonials, must be delivered to me in a sealed envelope, endorsed "Electrical Engineer and Manager," not later than 15th July, 1933.

Copies of the terms and conditions of appointment and the form of application may be obtained from me.

Canvassing members of the Council, either directly or indirectly, is prohibited, and will be a disqualification.

WM. E. STANLEY,
Clerk to the Council.

Town Hall,
Long Eaton.
21st June, 1933. 2978

ENGINEER.

CAPABLE Ambitious Engineers please note. Old-established Electrical Manufacturers with ample financial backing would find progressive opening for keen Engineer able to introduce new lines for manufacture. Successful applicant would be required to superintend design and production, so must necessarily have a thorough knowledge of the speciality proposed.—Only those with the requisite qualifications please apply in confidence, stating experience fully and brief details of proposition to Managing Director, 2979, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SALES ORGANISER.

TECHNICAL Commercial Leader wanted to develop sales organisation of Industrial Section of a large electrical company. General knowledge of application of electrical apparatus for industrial purposes in all branches of the industry required. High salary will be paid to man having the necessary qualifications and experience.—Write, giving full details, to 6228, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

A VACANCY for a Chief Purchasing Officer occurs in the Buying Department of an organisation purchasing stores on an extensive scale for passenger transport, electricity and other undertakings. Applicants must have technical and commercial experience, with organising ability, and a thorough knowledge of commodity markets.—Box 77, Electrical Press, Ltd., 13/16, Fisher Street, London, W.C.1. 2974

AN old-established Company manufacturing a.c. and d.c. Motors and Fans require the services of a Works Manager. Applicants must have had wide experience in similar position, and be able to furnish evidence of ability to organise production on a competitive basis. Buying experience an advantage but not essential. Replies, stating qualifications, experience, salary required, and enclosing copies of testimonials will be treated in the strictest confidence.—6246, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

APPLICATIONS are invited for the position of Boiler-house Foreman Mechanic, to take charge of the running, overhaul and maintenance of the water-tube boilers, mechanical stokers, steam mains, etc., in the boiler-house of the Stepney Borough Council's Limehouse Generating Station. Applicants must have previous experience in a similar position and must be capable of controlling men. Copies only of not more than three recent testimonials are to be enclosed with the application. Consolidated salary, inclusive of all overtime, £6 10s. per week. The successful applicant will be required to pass a medical examination and to contribute to the Council's Superannuation Fund.—Applications in writing addressed to the Consulting Engineer & Manager, 27, Osborn Street, Whitechapel, London, E.1, not later than Wednesday, July 5th, 1933. 2997

AUTOMATIC Telephone Circuit Design Engineer. Only thoroughly experienced applicants considered.—Apply, stating qualifications, age, salary required, 3017, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

CABLE Jointers required.—Apply in writing, stating age and experience and enclosing copies of testimonials, to the Borough Electrical Engineer and Manager, Electricity Works, 85, London Road, Southend-on-Sea. 3006

COST man required; practical experience of cables and wires essential.—Full details of experience, age, and salary required to 3011, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

DESIGNER and Salesman for electric power units, suitable for machine tools and woodworking machines. Previous experience necessary.—Apply Brook Motors, Huddersfield. 2995

ELECTRICAL Engineer. Electrical Contractors and Manufacturers (Nottingham) require Electrical Engineer to take charge of small workshop. Must be experienced draughtsman with good knowledge of electric lifts, electrical contracting, repairs, manufacturing work, and able to interview.—Apply, stating age and experience, references (copies only), and salary expected.—3019, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

EXPERIENCED man required for maintenance work. Must be qualified in fitting, stoking, and electrical plant. Wages £2 5s. per week, rising to £2 7s. 6d. per week at the end of six months, with meals whilst on duty and overalls.—Apply by letter, stating age and full particulars, to the Medical Superintendent, County Sanatorium, Ware Park, near Ware. 2981

FOREMAN for Winding Shop required for electrical firm in London district. One accustomed to small dynamo and motor work, also high and low voltage windings and used to control of female and juvenile labour.—Write, stating age, experience and salary, to 2910, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

METER Engineer required for Design Department, leading firm of Electrical Meter Manufacturers. Experience in prepayment meter design essential, also knowledge of instrument transformers and small motors.—Only first-class men need apply, stating qualifications and salary expected to 3012, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

REPRESENTATIVE required on commission basis to run a very competitive line of small iron clad switchgear.—2991, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

REPRESENTATIVES required for West End electric and radio factors. Must have connection (state area covered). Commission and allowance for expenses. With car preferred. —All details to 2985, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SALES Engineer (young) required immediately by Electrical Engineering firm in Midlands. Must be experienced in Motors and Control Equipment.—Apply, stating age, experience, and salary required, to 2970, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

TEST-ROOM Assistant required for electrical firm in Home Counties. Must be fully qualified technical man, preferably with experience of fractional horse-power motors.—Apply, stating age, experience and salary, 3020, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SITUATIONS VACANT.—*Continued.*

TRAVELLER required by London Wholesale House to call upon Contractors, Works, and Institutions. Commission and expenses first month, and if satisfactory, permanency, salary, commission and expenses. Reply, giving full details in strict confidence.—6254, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

TRAVELLERS calling on users of electric lamps and looking for easy-selling side line, generous commission.—Apply to 3000, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

YOUNG Physics Graduate required by North London firm, for high vacuum investigation in connection with radio valves.—Apply by letter, to 3018, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

Portsmouth City (Junior Consumers' Engineer).

SITUATIONS WANTED.

YORKSHIRE OR NORTH OF ENGLAND REPRESENTATION.

FULLY qualified Electrical and Mechanical Engineer, B.Sc. Hons., age 43, for the last 11 years Leeds Office Manager to very large Electrical Mfg. Co., would be pleased to hear from firms requiring first-class representation in Yorkshire or the North of England. Excellent connection and credentials.—6227, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

EXPERT.

EXPERT on paint, enamel, stoving, cellulose spraying and finishing, expert and speedy signwriter, requires piecework contract with large firm. Used to speedy factory output. Bring own staff if required. England or abroad.—6231, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

A CAPABLE Clerk (31), seeks appointment. Fully trained office and works management, buying, factory costing, stores, despatch and traffic control, etc. Highest testimonials. —Write 6158, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

A CAPABLE Electrical Engineer (28), with sound practical training, responsible position, 2 years junior, 3 years senior, first-class certificate A.M.E.E., desires junior position with good prospects for ability; good references; wishes to enter municipal work especially.—6209, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

A CAPABLE Sales Engineer, experienced works, drawing office and consulting, requires position; known to London contractors.—6240, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

A KEEN young man (22), good electrical and mechanical engineering experience, seeks post, sales, inspection, technical, or service staff.—6205, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ADVERTISER engaged in Electrical business seeks change. Experienced business controller, sales organiser on large scale, multiple shop buyer and manager. Capable taking full control, increasing business and introducing perfected systems. Energetic, conscientious. Can offer progressive firm experienced services. Moderate commencing salary.—6237, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ADVERTISER, residing in Oxfordshire, seeks post as Representative, good knowledge of electrical installation, supplies and apparatus.—6195, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ADVERTISER seeks post as Representative or Agent. Accessories, cables, lamps, &c.; South Midlands; own car. —6267, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ADVERTISER seeks situation, sales, order or stores department; capable of taking charge; over 20 years' experience in the electrical industry.—6244, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ADVERTISER, single, well educated, desires change of appointment in position of trust, where tact, foresight, and administrative abilities could be utilised to advantage. Has received over 25 years' practical, commercial and executive experience in all branches of electrical contracting and installation work, but is desirous of more scope and prospects; moderate salary.—6222, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ADVERTISER, 27 years' experience accumulators, dry batteries, and wireless, 14 years' works manager, 7 years' sales manager, seeks berth.—6198, Electrical Review, Dorset House, Stamford Street, S.E.1.

ADVERTISERS (Bricklayers) want repair work to Babcock's, Sterling's or Thompson's Boilers; renewing arches (suspended or sprung) a specialty; day or contract; any district. —6215, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SITUATIONS WANTED.—*Continued.*

AMBITIOUS young man (20), National Certificate (Electrical Engineering), studying for A.M.I.E.E., desires position in which further electrical experience can be obtained.—A. B., 112, Lauriston Road, Hackney, E.9. 6251

ARMATURE Winder, first-class workman, repairs or repetition work.—6221, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ASSISTANT Electrical Designer desires post in or near London, 25 years' experience.—6234, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

COLLIERY Electrician seeks post; reliable, all-round man. —6162, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

CONSTRUCTIONAL Plater and Electric Welder, 10 years last situation; good all-round.—Barrett, 51, Nuneaton Road, Dagenham. 6200

CONSULTING Engineers requiring an Assistant are invited to write.—6235, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

DR. BARNARDO'S Homes require situations for lads, 14-16, as Engineer Apprentices.—Apply Situation Department, 18-26, Stepney Causeway, E.1. 2965

DRAUGHTSMAN, Junior, desires position with engineers or contractors where tracings for blue prints, and detail drawings required. (Stud. B.I.E.T.).—6184, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRIC Lamp Engineer and Manager, extensive ring and non-ring experience, all types. Every branch, quality and production.—6170, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICAL Engineer offers services to high-class consulting engineers as Inspector; many years' experience testing and designing, etc.—6232, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICAL Engineer, young, Faraday House Diploma, drawing ability, seeks position.—G. W., 62, St. Stephen's Avenue, London, W.12. 6207

ELECTRICAL Engineer, 23, with varied representing and service experience, requires situation with reliable London firm.—6178, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICAL Engineer (24), B.Sc., with test room, manufacturing and erection experience, ambitious, energetic, desires progressive position.—6212, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICAL Engineer, 28, single, articled with a chief engineer, experience with Diesel engine generation, design and construction of overhead lines, e.h.t. and l.t., obtaining wayleaves, main laying, sub-station and transformer erection, change-overs, present position junior mains engineer, seeks position with good prospects; home or abroad preferred. —6250, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICIAN, disengaged, 15 years' experience electrical installations, maintenance, breakdowns, rewinds, repairs all types a.c.-d.c. motors, etc. Some time charge hand. Trustworthy, efficient, dependable. References.—L. D., 22, Dancer Road, Fulham, S.W.6. 6224

ELECTRICIAN, long experience screwed barrel jobs, etc., anywhere.—111, Rush Green Road, Romford. 6252

ELECTRICIAN, Mechanic (24), technical diploma, seeks employment, maintenance, repairs, experimental or assembly; excellent references.—6173, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICIAN or Technical Salesman. Fifteen years laboratory, workshop and installation experience of telephony. Technical training. C. and G. final.—6269, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

ELECTRICIAN, plant or wiring, any job, any distance.— 71, Kenthouse Road, Sydenham. 6182

ELECTRICIAN requires situation, age 27, experienced power, lighting, heating, installation or maintenance.— G. H. Dimond, 124, Chase Side, Enfield. 6226

ELECTRICIAN seeks situation; constructional or maintenance, telephones a speciality.—O. Verran, 12, Kendoa Road, S.W.4. 6166

ELECTRICIAN wants work, any capacity, anywhere.—C., 1, Venetia Road, N.4. 6194

ELECTRICIAN, Wireman, all systems; anywhere.—A. J. Carney, 175, Waterloo Road, S.E.1. 6183

ELECTRICIAN-Wireman wants situation or job, all-round hand, also ship or yacht work; take piece-work.—A. C., 168, Chamberlayne Road, Eastleigh, Hants. 6268

ENGINEER (22), with sound training in electrical and mechanical engineering, seeks employment at home or abroad, any capacity; good references.—6229, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

FOREMAN Linesman, 15 years' experience, all types overhead construction, sub-stations and underground cables. Excellent references. Home or abroad.—Hart, 8, Millerfield Place, Edinburgh. 6199

GALVANOMETER Mounter seeks post as Maintenance Hand.—6210, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

INSURANCE Engineers who require an Electrical Inspector are invited to write.—6236, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

JIG and Tool Designer, 20 years' experience supervising manufacture of light Electrical and Mechanical Apparatus and Designing Tools, etc., for mass production, seeks responsible post in London area.—6206, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SITUATIONS WANTED.—*Continued.*

LAMPS (Electric).—Young man with six years' technical and control experience seeks employment.—6216, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

LECTURER in Electrical Design, M.I.E.E., 20 years' works, costing and design experience. Day or evening classes, whole or part time.—6233, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

MAINTENANCE Engineer (45) seeks working supervisory post, where services of a trustworthy, versatile man would be appreciated. Used to all classes steam, hydraulic, i.c. and electrical plant, refrigeration cranes, conveyors, repairs. Life experience, coupled with sound technical knowledge. Excellent references. Moderate salary.—6191, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

METER and Technical Sales Engineer, practical experience all branches of electrical industry, 7 years sales manager, seeks appointment. Established connection all classes of buyers South Wales and West of England. Highest testimonials.—6253, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

PLUMBER-Jointer desires situation, anywhere.—6249, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

RADIO and Electrical Engineer (32), technical, practical, and sales experience, seeks position as Representative for established firm.—2, Court Drive, Sutton, Surrey. 6243

RADIO Engineer, 24 years good technical knowledge, 8 years practical experience, engaged, desires change with retailer or manufacturer.—6241, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

REPRESENTATIVE, excellent connection, Southern Counties; own car.—6230, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

REPRESENTATIVE, ten years' electrical experience, first-class connection London, South Coast; excellent references.—6256, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

REPRESENTATIVE, with excellent personal connection with Corporations, Stores, Factors and Contractors, own car, will represent wholesale house on commission and small part expense.—6165, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SALES.—Young man, with 6½ years' technical experience of electric lamp manufacture, desires to prove his capabilities in commercial or sales work. Trial at any salary.—6242, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SECRETARY, Barrow & Co., Ltd., Electrical Contractors, Bury (closing down), experienced accountant, secretarial duties, cashier, office manager, estimating, seeks position, any district; reasonable terms.—F. Hartley, 8, Palatine Drive, Bury. 6248

TELEPHONE Engineer (29), 7 years' experience testing, wiring, maintenance, Strowger automatic, manual, intercom. and P.A.B.X. installations, good circuit knowledge, technical training; National Certificate Electrical Engineering.—6245, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

THIS advertisement will interest Directors who feel that if they could find the right man their business would be doing better; or that they could start another profitable department if they were able to find just the right man to organise and run it at a profit. During the past 14 years I have been successful in the following:—(1) Took control of a small company on the verge of liquidation and in two years paid off liabilities and created an annual turnover equal to five times the original capital. (2) Took control of another business from its inception and in three years established a turnover equal to five times the capital. (3) Organised a new department for a subsidiary of one of the largest companies in England and in three years sold £35,000 of high- and low-priced electric domestic appliances. Naturally, I am in a position to prove these statements. My special qualifications are: An exceptional aptitude for organising staff and salesmen training, advertising, creating ideas and finding new avenues for business. I am not offering to invest capital. I am asking you to consider seriously whether it would pay you to invest in my brains by taking me on your staff. I shall be quite prepared to prepare a scheme without obligation. Finally, I always prefer a part of my remuneration in the form of a percentage on turnover.—Write to 6188, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

TO Firms wishing to increase their provincial sales.—Advertiser, age 39, over 20 years' experience on sales side of the electrical trade, with splendid personal connection, requires position; excellent references.—6164, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

WIREMAN, disengaged, lighting, power, 'phones.—Shotter, 10, Lynwood Road, S.W.17. 6172

WIREMAN, good all-round, wants job or part time.—B., 5, Dalberg Road, Brixton, S.W.2. 6255

WIREMAN wants work, all systems.—W. T., 155, High Road, Willesden, N.W.10. 6265

WIREMAN (young) wants work, experienced in all branches of wiring automatic telephones, factory maintenance.—A. W., 181, Ramsay Road, Forest Gate, E.7. 6204

YOUNG Indian Electrical Engineer, B.A. (Madras), B.Sc. (Manchester), with 1 year practical experience, wants position with any firm or Corporation. Would go anywhere.—Write Box P. 1719, Scripps's, South Molton Street, W.1. 3003

YOUNG Man requires situation in electrical or radio trade. Fifteen years' experience clerical, stores, sales.—6223, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

SITUATIONS WANTED.—*Continued.*

YOUNG man, 20, 3 years' experience searching with prominent firm of patent agents, ordinary National certificate electrical engineering, 3 years Day Technical Institute, still studying, desires position.—J. McEvoy, 535, Downham Way, Bromley, Kent. 6239

YOUNG man (20½), 6 years' experience, wiring, maintenance, repairs; home or abroad.—Edwards, 130, Coombe Lane, Wimbledon, S.W.20. 'Phone Wim. 0561. 6160

FOR SALE.

Advertisements are inserted under this heading at 14s. per inch.

COUNTY BOROUGH OF PRESTON.

Electricity Department.

THE Electricity Committee invites offers for the purchase and removal of the undermentioned plant, which they have for disposal in consequence of the change-over of the system of supply from d.c. to a.c.

3 1,500 kW Rotary Convertor Equipments.

2 500 kW Rotary Convertor Equipments. Makers: English Electric Co., Ltd.

1 500 kW Rotary Convertor Equipment. Makers: Metropolitan Vickers, Ltd.

1 17 panel d.c. Switchboard. Makers: Metropolitan Vickers, Ltd.

The plant may be seen by appointment, and full details of same obtained from J. F. Simpson, Borough Electrical Engineer, 41, Lune Street, Preston. 2941

13th June, 1933.

MIDLAND COUNTIES ELECTRICAL ENGINEERING CO., LTD.

Grice Street, Spon Lane, West Bromwich.
Telegrams: Rheostat, West Bromwich.

Reduced Prices.

500 MOTORS, Dynamos, Rotary Converters, Transformers, all voltages and frequencies; 310-kW and 250-kW Rotary Converters, 6-ring, 50-cycle, 3-phase, to 220 volts d.c; as new.

Switchgear, Instruments, Welders, Generating Sets, &c., in stock. Best makes. New and equal to new. Fully guaranteed. Inspection and inquiries invited. 6

ELECTRIC WELDING SET.

Manufacturers: Metropolitan Vickers, Ltd.

D.C. Motor, 9 b.h.p., 500 volts, 19 amps., 1,400 r.p.m.

Generator, 70 volts, 175 amps.

Complete with Starting and Control Panel.

In good running order.

Apply THE YORKSHIRE (W.D.) ELECTRIC TRAMWAYS, LTD.,
Savile Town, Dewsbury.

2988

REEVE BARLOW & CO.,
78, Hampstead Road, Euston, London, N.W.1.

Telephone: Museum 8463.

NEW and Second-hand Motors, ¼ to 1 h.p., in stock. Repairs to Electric Motors, Transformers, Electric Tools, Vacuum Cleaners, Electric Fans, Hair Dryers, etc. Armatures and Coils wound. Fractional h.p. Motors converted from d.c. to a.c. A.C. Motors re-wound and converted to suit required periodicity.

Estimates free. All repairs fully guaranteed.
Official Repairing Agents for the British Isles for:
Wagner Electric Motors, Westinghouse Electric Motors.

2845

ACTUALLY IN STOCK AT BAMFORD.

One 480/510 B.T.H. Vickers-Petter Crude Oil Engine, six cylinder, 250 r.p.m., solid injection, stationary type.

ALSO

One 24/28 B.H.P. Petters, Semi-Diesel Engine, 525 r.p.m., vertical two-cylinder, stationary type.

Detailed quotation on request.

MYLAN & SMITH (ENGINEERS), LTD.,
BAMFORD, VIA SHEFFIELD.

3

FOR SALE.—*Continued.*

PURCHASERS PLEASE NOTE.

WE CARRY A STOCK OF OVER 1,000 MOTORS AND GENERATORS, BOTH A.C. AND D.C., RANGING FROM ¼ to 250 H.P., AND ONLY HANDLE MODERN MACHINES WHICH ARE GUARANTEED FOR TWELVE MONTHS.

Please Send your Inquiries to:—

THE CENTRAL ELECTRICAL ENGINEERING WORKS,

Head Office and Works: Yate, Near Bristol.
'Phone: Chipping Sodbury 111 (2 lines). 17

THE LARGEST FACTORS OF
NEW AND SECOND-HAND
ELECTRIC MOTORS IN THE U.K.

E. P. ALLAM & CO., LTD.,
107-109, Gray's Inn Road, London, W.C.1.
'Phone: Holborn 5848-5849.
1873

MOTORS BEST MAKES.

3-PHASE AND D.C.
Rewinding our speciality.

HOUCHIN LTD.,
Garford Street, E.14.
2558

GREENHALGH BROS.,
Atherton, near Manchester.

WE carry one of the largest stocks in Electric Plant of all descriptions in the country All guaranteed and at reasonable prices. 'Phone: Atherton 117. 5

ELECTRIC MOTORS AND DYNAMOS.

WE hold one of the largest Stocks of New and Secondhand Motors. Secondhand machines are thoroughly overhauled. Inspection and Tests can be made at our Works.

For Sale or Hire. Send your inquiries to:—
BRITANNIA MANUFACTURING CO., LTD.,
22-26, BRITANNIA STREET,
CITY ROAD, LONDON, N.1.
Telephone: 5512-3 Clerkenwell. 13

DEVON MENTAL HOSPITAL.

FOR Sale, Compound Belliss and Morcom Steam Set, coupled direct to Newton's shunt wound interpole generator, 200-250 volt, 60 kW.—For further particulars apply to the Engineer, Devon Mental Hospital, Exminster, near Exeter. 2989

FRACTIONAL H.P. MOTORS.

COMPLETE set of Working Drawings, Data Sheets, together with sundry Jigs, Tools and Patterns, stock of parts, for split-phase a.c. Motor. Design approved and ready for manufacture.

2993, Electrical Review, Dorset House, Stamford Street, London, S.E.1.

600.

FOR GUARANTEED
ELECTRIC MOTORS, A.C. and D.C.

WE carry one of the largest stocks of a.c. and d.c. Motors and Generators in the country. Machines of modern design at low prices, from 1/20 h.p. to 2,000 h.p.

OBTAIN OUR QUOTATIONS ALWAYS BEFORE PURCHASING.

Please communicate with our nearest office.
GEORGE COHEN, SON & CO., LTD.
South: 600, Commercial Road, London, E.14. North: Stanningley Works, Stanningley, Leeds. Wales: Gasworks, Neath. Ireland: Sydenham Road, Queen's Quay, Belfast. 3013

Advertisements are inserted under this heading at 1s. 9d. per line.

A.—LARGEST Stock of Searchlights in the World, Sale or Hire; Carbons, Repairs.—London Electric Firm, Croydon. 2290

A BIG stock of surplus Pulleys, Shafting, Hangers, etc.—The London Electric Firm, Croydon. 1953

A.C. and D.C. Motors, reconditioned, guaranteed. All sizes and voltages.—F. W. Langley & Co., Hanley, Staffs. 2553

FOR SALE.—*Continued.*

AMMETERS, Voltmeters, House Service Meters, &c., low prices; meter repair of every description.—The Victa Electrical Co., 47, High Street, S.W.11. 6017

CORNICE Lighting, all shapes and sizes. Send requirements. —D. Walter & Co., 107, Newington Causeway, S.E.1. 1125

DYNAMOS.—12 V, 250 amp. Electromotors; 6 V, 250 amp. Cutting. Motors—3 h.p., 346/50/3 slip ring Parkinson; 2 h.p., 460 V. d.c. Electromotors; 1 h.p., 480 V. d.c. Newton. All cheap.—Boys, 187, Goswell Road, E.C.1. 6364

MANY new and second hand Motors, ½ to 1 h.p., by well-known makers, 100 and 240 volt, a.c. and d.c. Price 5s. to £3 each.—The Williamson Film Printing Co. (1931), Ltd., 4, Denmark Street, W.C.2. 3005

MEGGER Insulation Tester, 500 V, by Eversheds, as new; £8, with leather case.—17, Cleveland Avenue, London, W.4. 6266

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E.R. 5

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E.R.31

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The new

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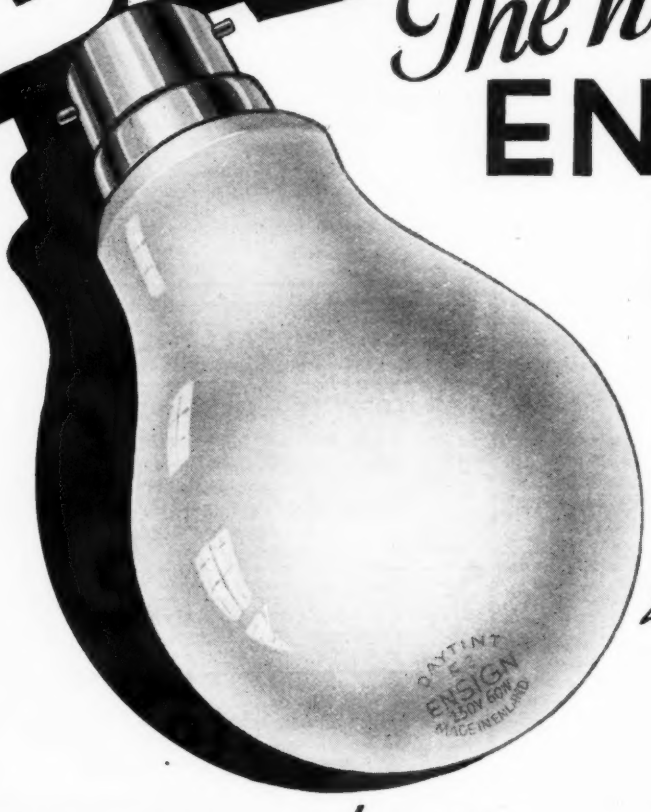

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IDEAL FOR SHOPS, FACTORIES, HOSPITALS, IN THE HOME, AND ALL GENERAL LIGHTING PURPOSES.

Supplied in 60 Watt-upwards

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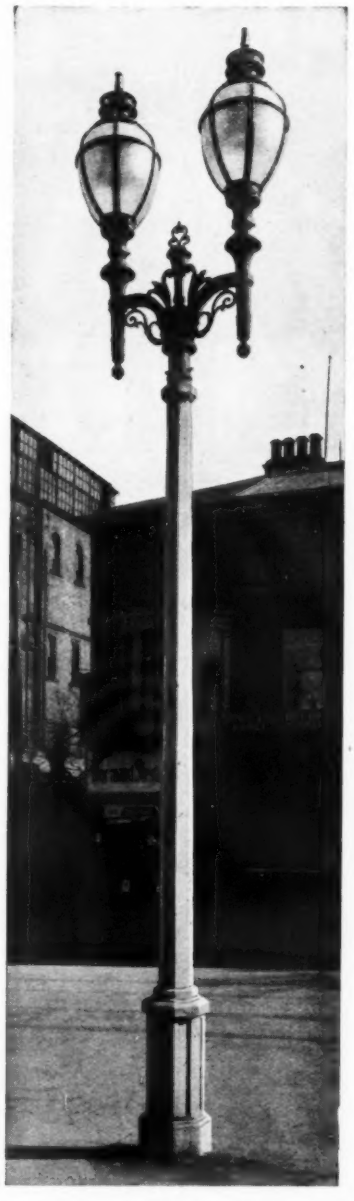

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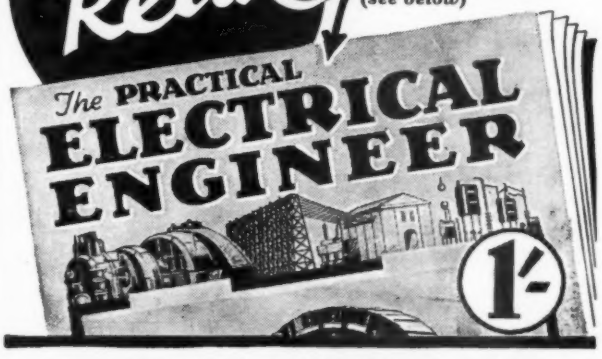

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SPECIAL FEATURES IN THE JULY ISSUE.

A PRACTICAL DEMONSTRATION OF THE PROPERTIES OF MICRO WAVES.

This article contains a complete description of the new Marconi Micro Wave Demonstration Apparatus, and also an illustrated account of several interesting experiments carried out with the apparatus. Micro Waves, i.e., wireless waves below one metre in length, are likely to become increasingly important in the near future. Keep in touch with this new development by reading the article in the July issue.

THE ELECTRO-MATIC TRAFFIC CONTROL SYSTEM.

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POWER FACTOR IMPROVEMENT.

BY E. W. DOREY, A.M.I.E.E.

In this article Mr. Dorey explains clearly the practical methods of solving power factor problems as they present themselves to the works and factory engineer. Every distribution and works engineer should read this illuminating treatment of a difficult subject.

PRACTICAL NOTES ON THE I.E.E. WIRING RULES.

BY D. WINTON THORPE, A.M.I.E.E.

This month Mr. Thorpe, in an illustrated article, gives practical comments on the Rules with special reference to the erection of cables and wires. Installation engineers, wiring contractors, and works engineers will find these notes of particular interest.

METHODS OF SWITCHING—IN ROTARY CONVERTERS.

BY F. C. ORCHARD, A.M.I.E.E.

In this article Mr. Orchard explains all the standard methods including tap starting, pony motor starting, Dr. Rosenberg's system, the synchronous induction motor method, synchronising by hand, starting up from the D.C. side. The principles of automatic starting are also explained. Altogether a most useful article for substation engineers and others interested in electrical transmission and distribution.

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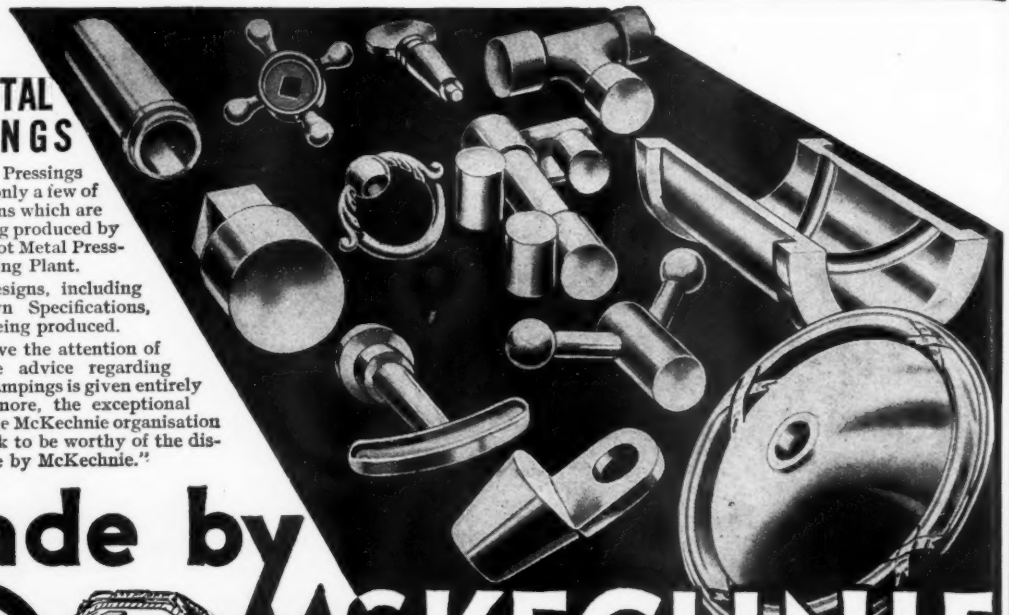

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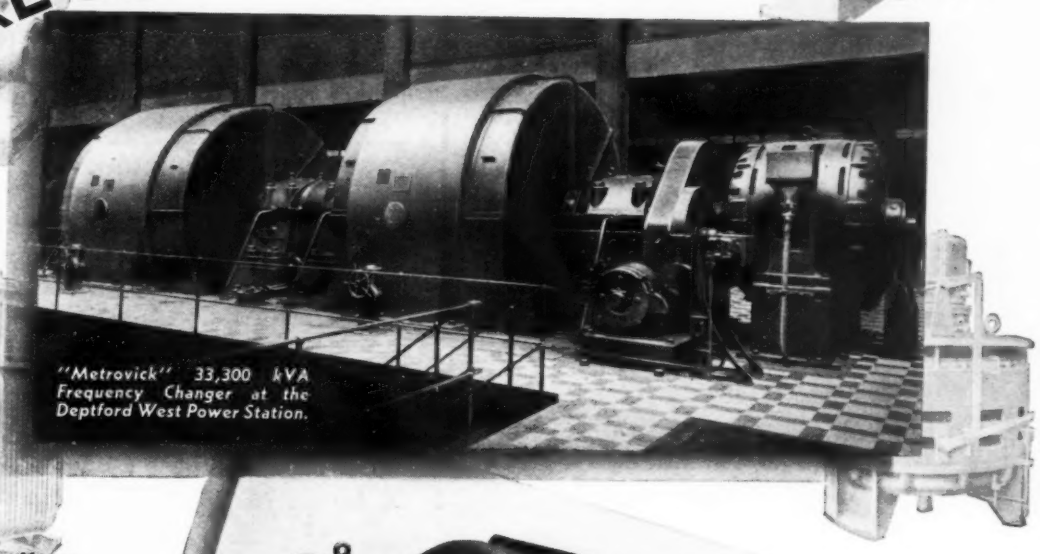

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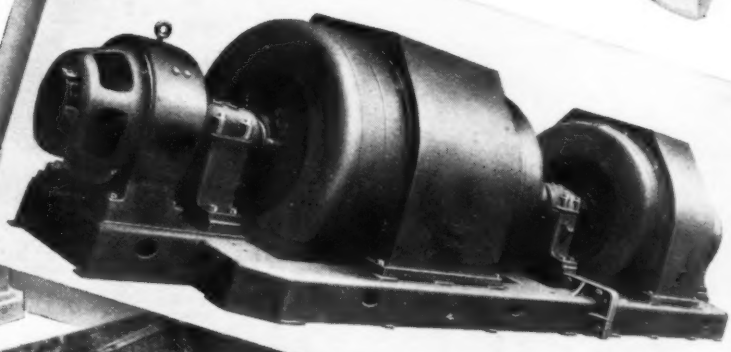

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TENDERS are invited from manufacturers for the supply and delivery of the following:—

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Meters.

Specification and further details may be obtained on application to the Electricity Department, Council Offices, Portland. Tenders sealed and endorsed "Tender for ———," to be delivered to the undersigned before noon on Saturday, the 15th day of July, 1933.

The Council do not bind themselves to accept the lowest or any Tender.

LESLIE B. LEE,
Clerk of the Council.

Council Offices,
Portland.
23rd June, 1933. 2990

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Applications to tender, which must be received not later than 5th July, should be accompanied by a deposit of £2 2s. by cheque, which will be returned upon receipt of a bona-fide tender. Sealed tenders, on the Form, and in the envelope provided, must be delivered to the undersigned not later than first post on Monday, 24th July, 1933.

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Architect.

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June, 1933. 3010

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Electricity Department.

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The lowest or any tender will not necessarily be accepted.

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(Signed) F. ENTWISTLE,
Clerk.

Town Hall,
Farnworth, Lancs. 2982

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Electricity Department.

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Specifications may be obtained upon application to A. J. Hutchinson, A.M.I.E.E., Engineer and Manager, Electricity Works, Albert Road, Farnworth, Lancs.

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Town Hall,
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TENDERS are invited from accredited manufacturers for the supply and erection complete of High Tension Switchgear and other Accessories at the Council's Power House, Eden Grove, Holloway.

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Tenders on the official forms must be enclosed in the specially marked envelope provided and delivered to the Town Clerk, Town Hall, Upper Street, N.1, not later than noon on Wednesday, 9th August, 1933.

The Council do not undertake to accept the lowest or any tender.

By Order,
R. H. JERMAN,
Town Clerk.

Town Hall,
Upper Street,
Islington, N.1.
24th June, 1933. 3002

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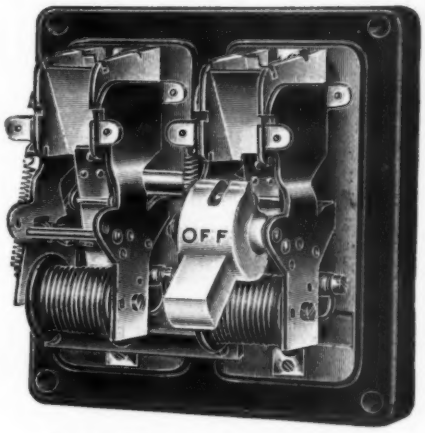

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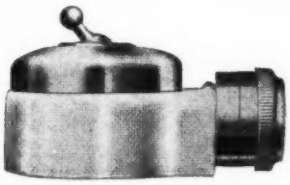

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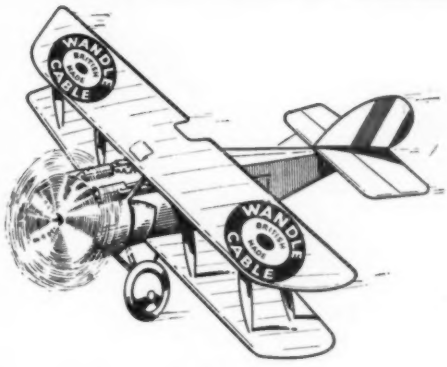

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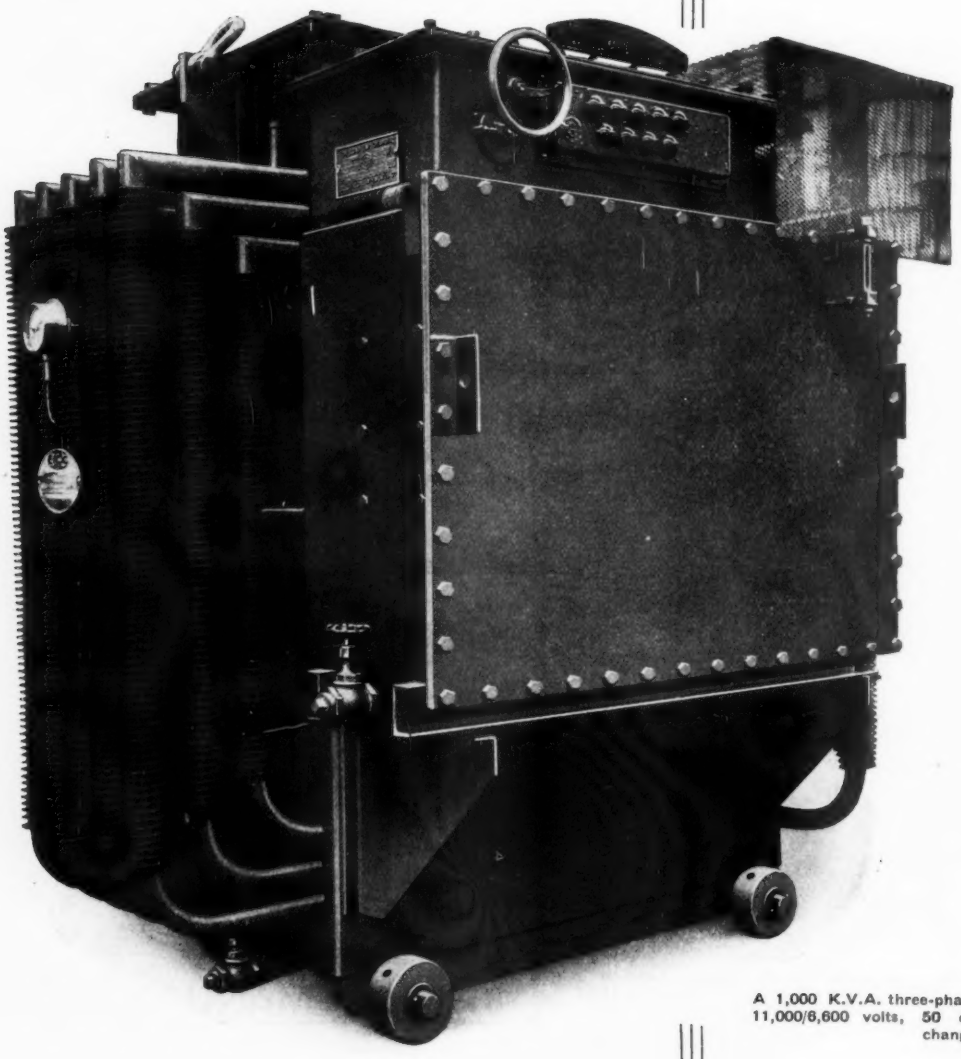

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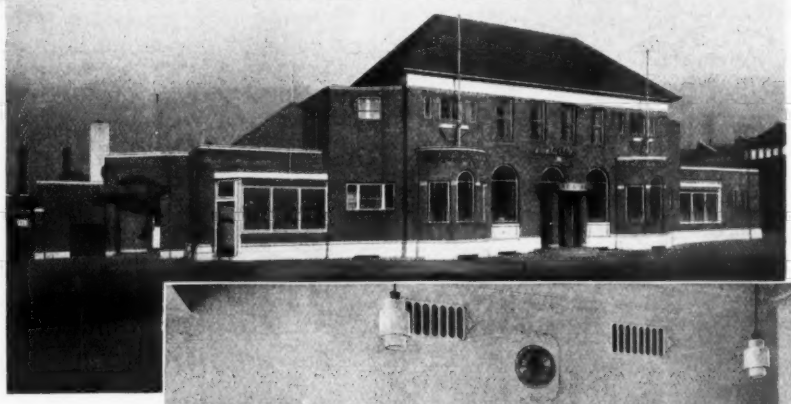

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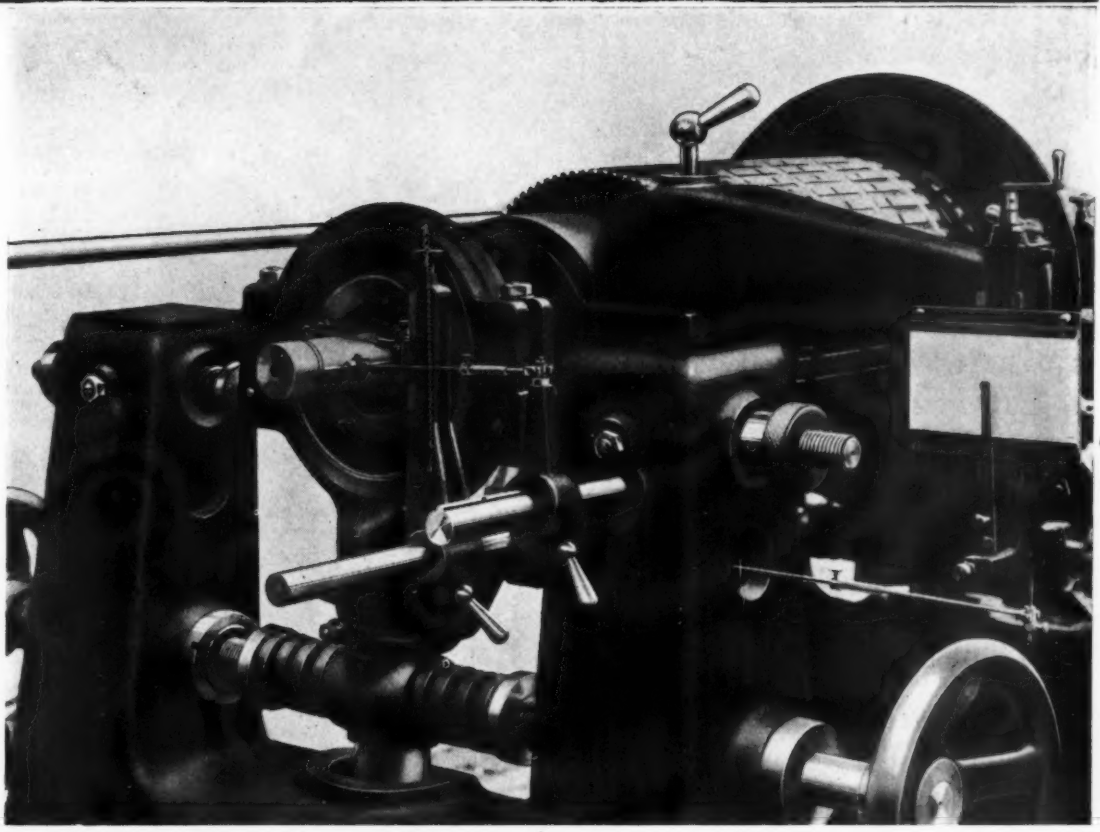

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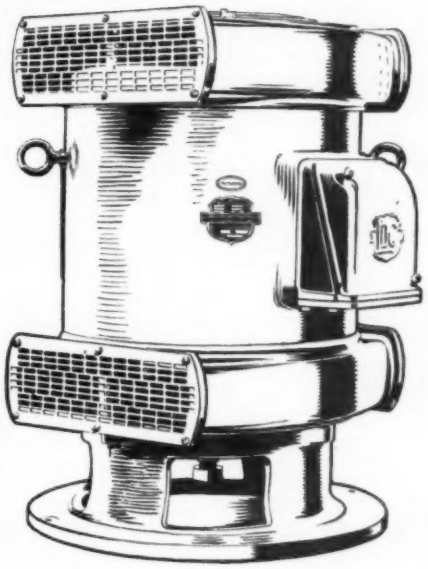

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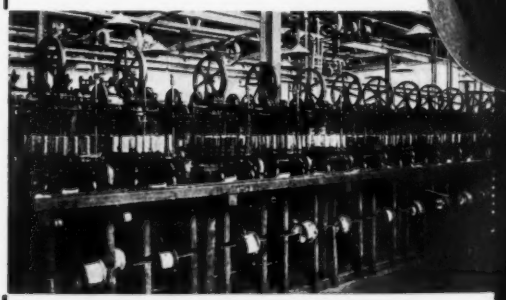

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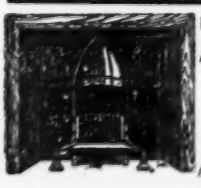

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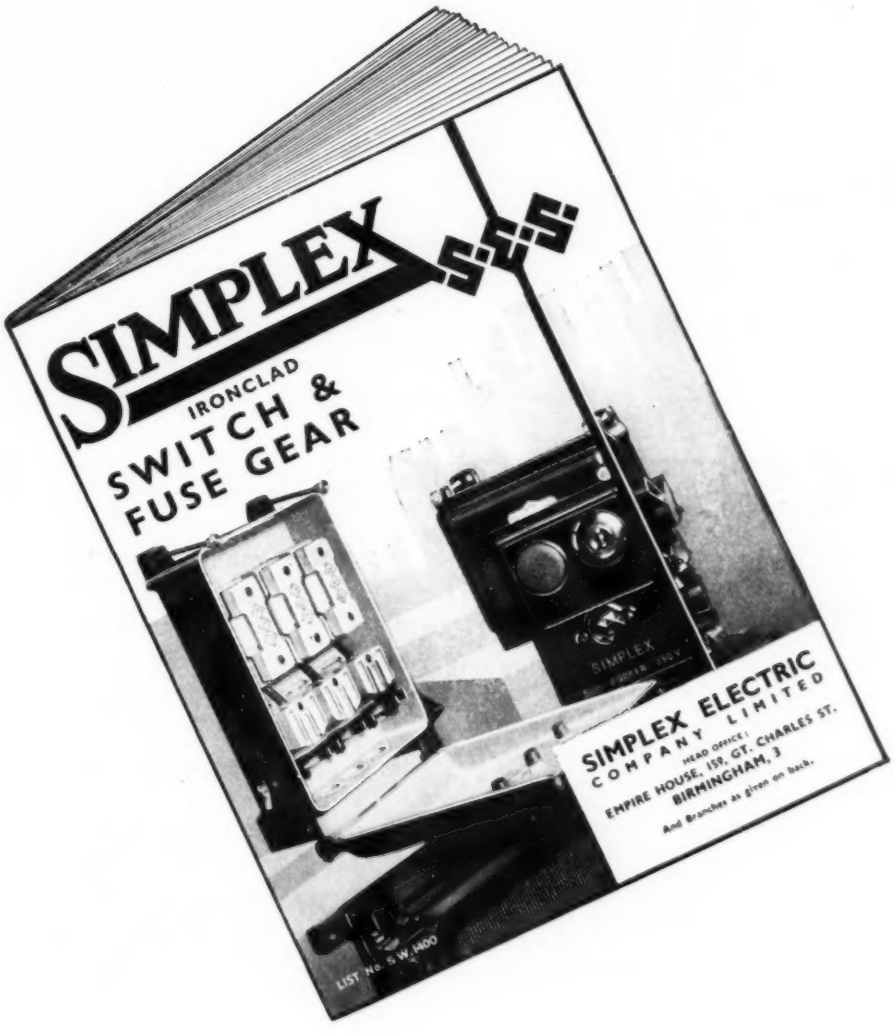

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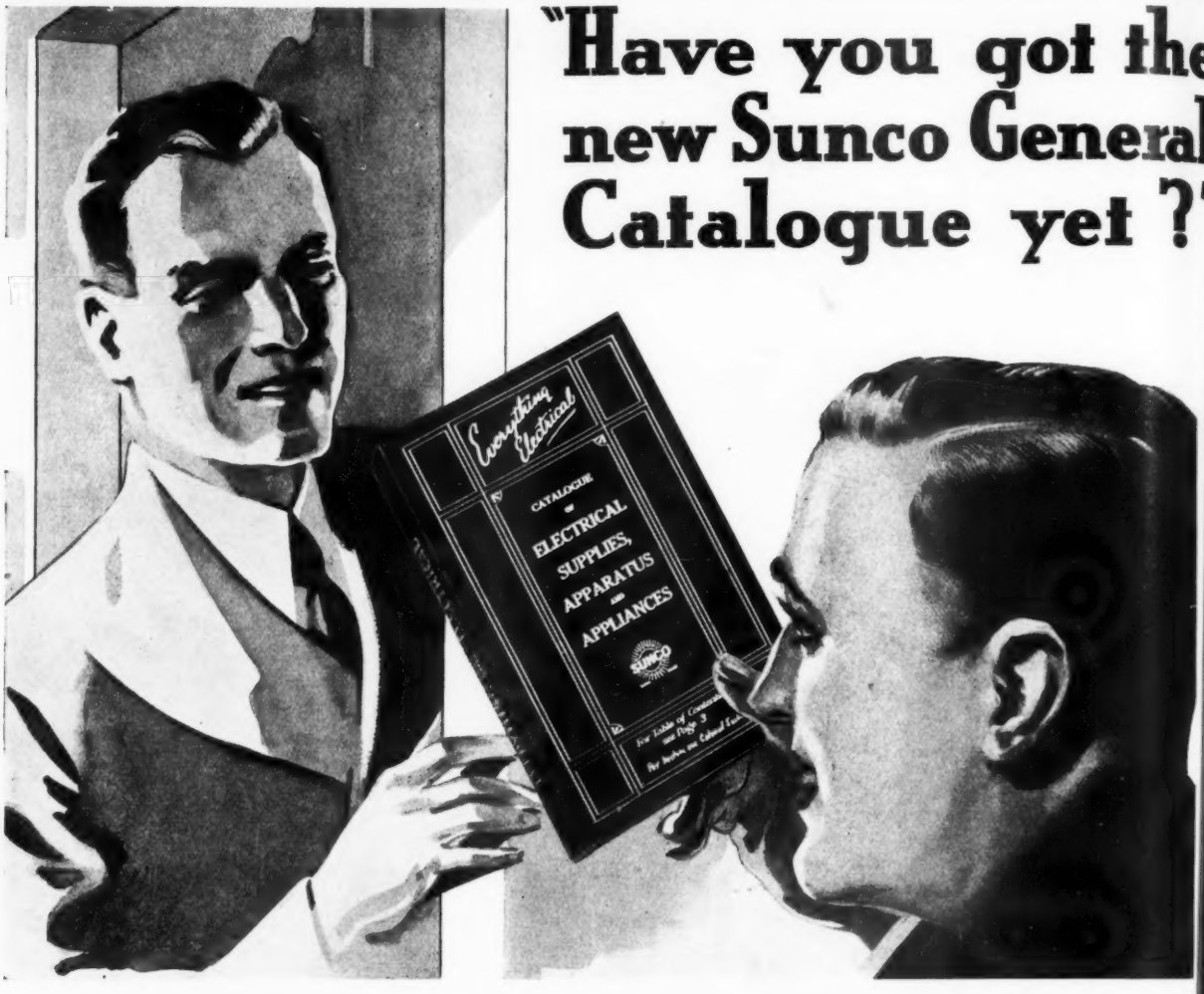

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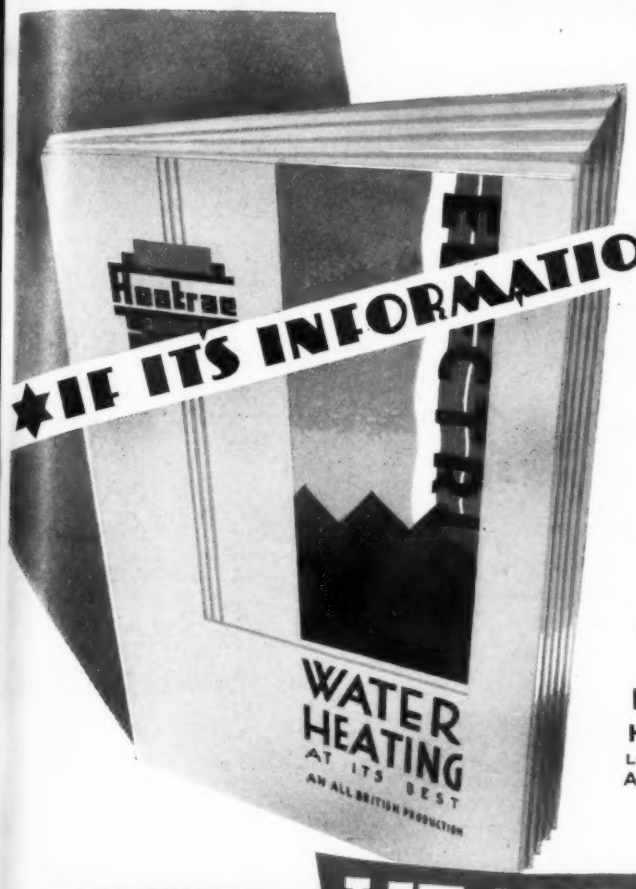

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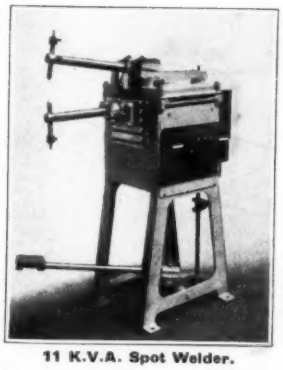

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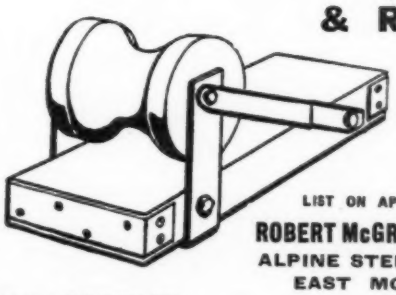

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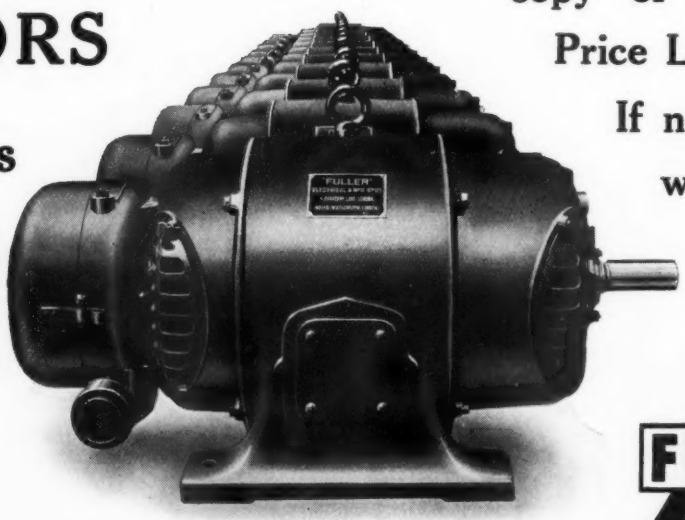

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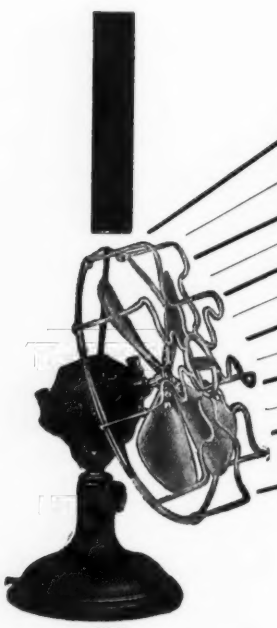

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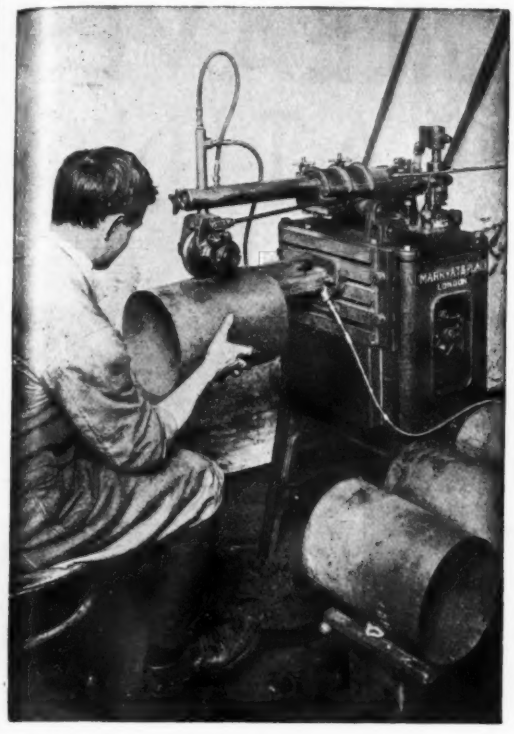

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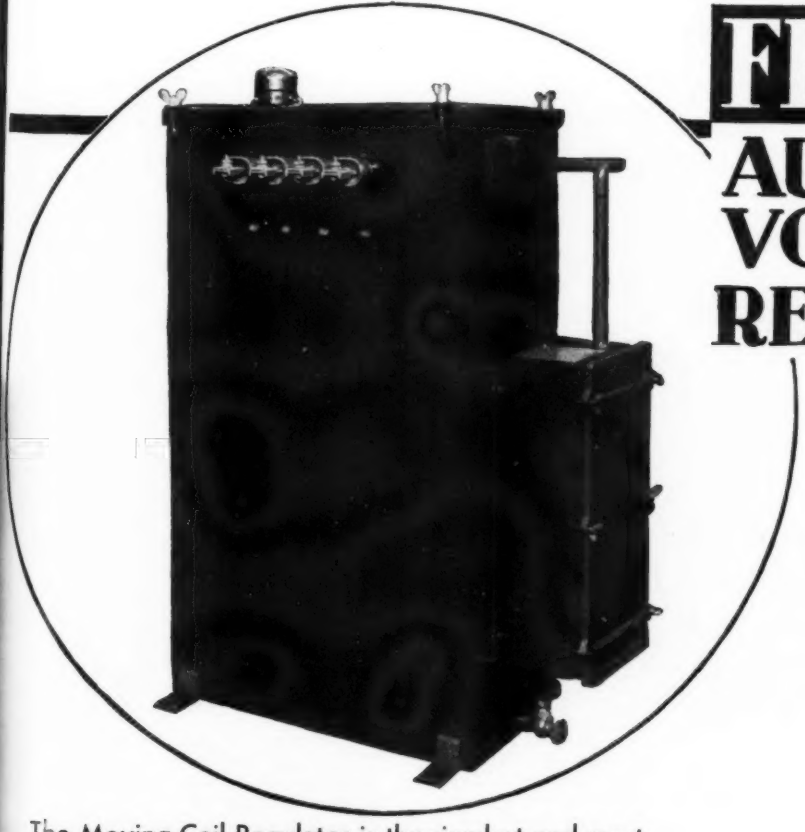

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3. Short-circuit Proof.
4. Supplied for any voltage.
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6. Indoor pole mounting or kiosk type.
7. Most lightly loaded mechanism.

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HICK, HARGREAVES DE-AERATING PLANT

Designed to provide
SIMPLICITY of OPERATION
MAXIMUM EFFICIENCY
LOW OPERATING COST

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PERFECTING THE ONE PRODUCT
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THESE WET ELECTROLYTICS ARE MADE UNDER SOLE LICENCE FROM THE CONDENSER CORPORATION OF AMERICA INC. BRITISH PATENT NO. 374188.

"We can but confirm that the service of the large quantities of condensers you have supplied us with has been excellent . . . we have not received a single one which could not be used with COMPLETE SATISFACTION"

Such are the words contained in a letter of appreciation received from a large Electrical Apparatus Manufacturer to whom we supplied 21,000 Wet Electrolytics. You, too, can be sure of similar satisfaction if you insist on "condensers by the expert" —T.C.C. Condensers.

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CONDENSERS *The Telegraph Condenser Co. Ltd., Wales Farm Rd., N. Acton, London, W.3*

B
T-H

ENCLOSED AIR-BREAK

MOTOR CONTROL PANELS

Give your motors the safeguards they require —easy acceleration, overload and under voltage protection.

25 H.P., 400/450 volt D.C. panel; covers removed.

7½ H.P., 400/550 volt A.C. panel; fitted with ammeter.

7½ H.P., 400/550 volt A.C. panel; covers removed.

D.C.
SHUNT OR COMPOUND MOTORS
(non-reversing)
up to 50 H.P.

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SLIP-RING MOTORS
(non-reversing)
up to 25 H.P.

INEXPENSIVE TO PURCHASE, ERECT, AND CONNECT.

Refer your Control Problems to BTH Specialists

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THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, RUGBY, ENGLAND

A 1482

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is another outstanding example of modern architecture.

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Provide Motive Power for most of the essential services of an important London landmark.

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INDISPENSABLE for all STRIP LIGHTING SIGN WORK & ILLUMINATIONS.
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Our laboratory is at your disposal; we believe we can show you a saving on castings if you will consult us.

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COST LESS
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Glasgow: 50, Wellington St. Manchester: 196, Deansgate.
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Heating, Ventilating and Air Conditioning Plants	*Publication U1128*
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Sturtevant products are of British manufacture

They say:—

"I want hot water quickly!"

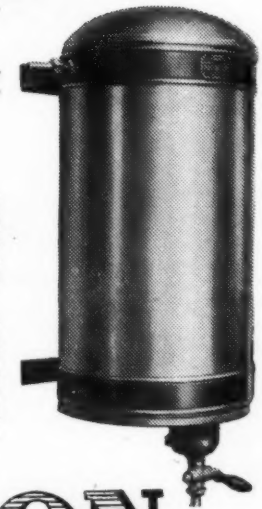
then fit the SANTON "YORK" STORAGE WATER HEATER.

Gives water for washing, shaving, etc., in five minutes—2½ gallons in 15 minutes, and *pro rata*.

Low cost—from £4 10s.
Economical to run, and
Guaranteed for 2 years.

Made of heavy gauge copper sheet of robust construction throughout, fitted with curved swinging outlet and black cellulosed brackets for wall fixing. Supplied in Polished Copper, Chromium Plated or Fabric Covered Finish.

Any voltage or loading (standard loading, 1 kW. for 2 gallon model and 3 kW. for 5, 10 and 15 gallon). The 2 and 6 gallon models are non-pressure types for supply at one tap only. The 10 and 15 gallon models have self-contained ball valves. The outlet, not under pressure, will supply any number of taps.



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"YORK" Storage Water Heater
(Patent No. 322,055)

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CABLE VARNISH.

A Flexible Varnish designed to cover the fibrous braids of electric cables, metallic tubing, etc., with a highly glossy protective film, resistant to water, steam, petrol, oil, alkalis, acids.

The protective coating on a cable will remain elastic, after being heated at 70° to 100° C. over a period of 100 hours.

The Varnish may be used for painting exposed V.I.R. Braided Cables already erected.

Made in three grades :—

Grade 44 is the best grade, not requiring thinners.

Grade 45 is the thickest ; it may be used with thinners or without.

Grade 48 is the thinnest and cheapest grade.

All grades are manufactured from the same materials in varying proportions, resulting in a difference in the number of applications required to produce the desired effect.

IMPREGNATING VARNISH.

No. 58J. Special.

For impregnating coil and armature windings, etc.

The Varnish can be applied and dried out without the necessity of using vacuum drying and impregnating plant. Impregnation of the coils is effected by dipping them in the Varnish, allowing it to soak in for a period of 15 to 30 minutes.

Drying out is best done at a temperature of 140° C. over a period of 40 to 60 minutes.

The Varnish resists acids and alkalis alike, and will withstand temperatures up to 600° C.

The protective qualities of the Varnish are not decreased by **HOT TRANSFORMER OIL, BENZOL, ALCOHOL, DAMPNESS OR FUMES OF ANY KIND.**

Manufactured at our own Works :— Brimsdown, Middlesex.

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Telephone : **HOLBORN 0591** (4 lines). Telegrams : "Enfelcama, 'Phone, London."

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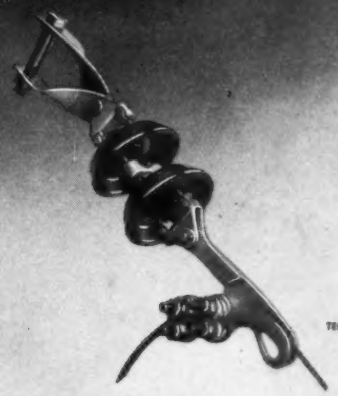
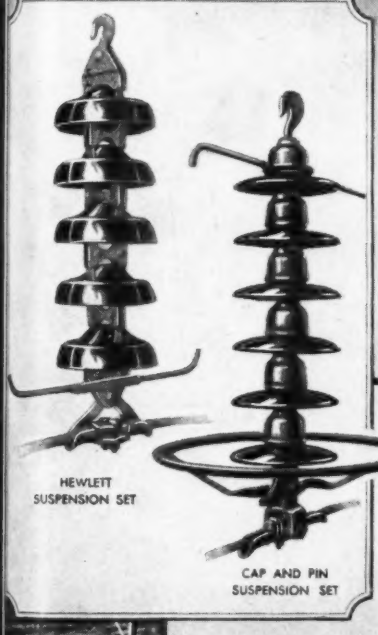
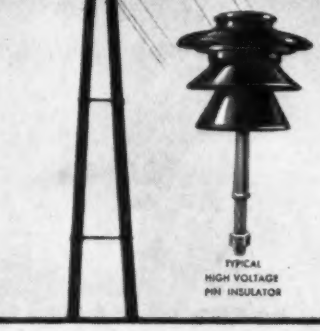


HEWLETT TENSIONING SET



HEWLETT SUSPENSION SET

CAP AND PIN SUSPENSION SET



TYPICAL HIGH VOLTAGE PIN INSULATOR

OVERHEAD TRANSMISSION EQUIPMENT

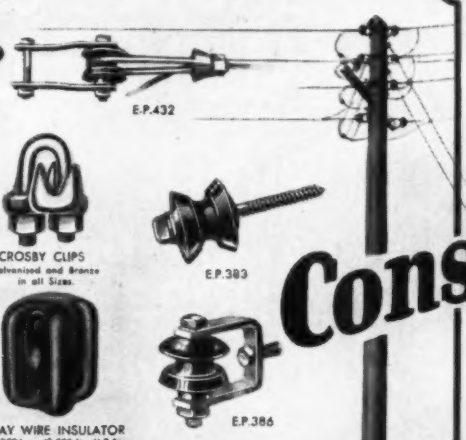
from

HIGH TENSION LINE TO DISTRIBUTION

BULLERS productions are manufactured entirely in their own works, both porcelain and ironwork. 90 years of ceramic and metallurgical research and experience lie behind their production and service.

Whatever your insulating problem, consult Bullers.

MANUFACTURERS OF all types of PORCELAIN INSULATORS and OVERHEAD LINE EQUIPMENT



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Galvanised and Bronze in all Sizes.

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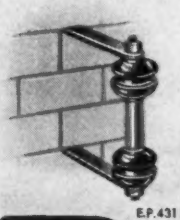

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1-9394 10,000 lb. U.B.S.
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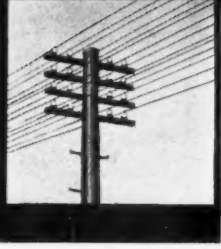
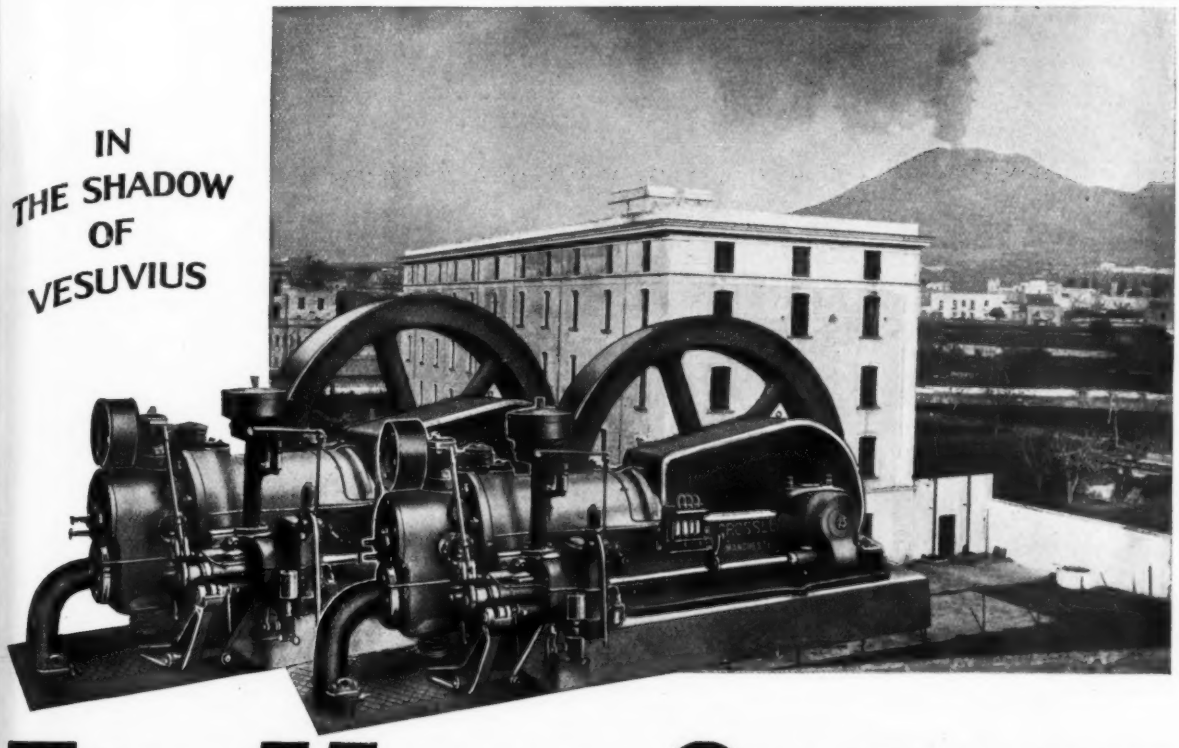


FREDERICK SMITH & COMPANY
(incorporated in The London Electric Wire Company and Smiths, Limited)
ANACONDA WORKS, SALFORD 3, LANCS
Telephone: Blackfriars 8701 (8 lines). Telegrams: "Anaconda, Manchester"
associated with
THE LONDON ELECTRIC WIRE COMPANY AND SMITHS, LIMITED.
THE LIVERPOOL ELECTRIC CABLE COMPANY, LIMITED.

IN THE SHADOW OF VESUVIUS



TWO 55 B.H.P. CROSSLEYS SAVING OVER £500 A YEAR

Flour Mill and Spaghetti Works,
TORRE ANNUNZIATA (Naples),

18th April, 1933.

Dear Sirs,

We are pleased to express our fullest and liveliest appreciation of the good working of the two engines HD.11 type, 55/66 B.H.P. each, supplied by you and erected in our works.

THE BEST ENGINE ON THE MARKET

The easy and immediate starting, the absolute reliability in running, and the perfect regularity of their working, give the maximum assurance and confidence to assert that they are the best engines that it is possible to find to-day on the market.

CONSUMPTION LESS THAN GUARANTEE

The fuel and lubricating oil consumptions are really lower than those of your guarantee.

MONTHLY SAVING OF £44-15-7

Having previously used electric power, and taking into account also the saving in coal that we now obtain, we can state definitely that by using your engines we are making a monthly saving of Lire 3,000 (£44 15s. 7d. with the rate of exchange of Lire at 67 to the pound).

(Signed) GENNARO JENNACO.

Not only do Crossley Heavy-Oil Engines effect a considerable saving as compared with electric supply, but also they can be relied upon to give uninterrupted service, year in, year out, with the minimum of attention. In the wide range of Crossley Heavy-Oil Engines are to be found types suitable for every power purpose. In each the same high standards of workmanship and faultless materials are embodied. Wherever Crossley engines have been installed there has been a definite saving on power costs.

The illustration shows the flour mill and spaghetti works of Messrs. Gennaro Jennaco of Torre Annunziata, Naples, with the two Crossley Heavy-Oil Engines in the foreground and Vesuvius smoking in the distance.

Single, double and multi-cylinder horizontal types from 6 to 2,200 B.H.P.

CROSSLEY

HEAVY-OIL ENGINES

Vertical Compressorless Diesel type in 2 to 6 cylinder sizes from 75 to 450 B.H.P.

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CROSSLEY BROTHERS LIMITED. OPENSHAW. MANCHESTER. ENGLAND.

For Safety
Know the Limits
of Your Electrical
Plant
AN ACTUAL TEST-PLANT PHOTOGRAPH
OF THE EFFECT OF ONLY 300,000 kV A FOR
A FRACTION OF A SECOND OUT OF CONTROL
A. REYROLLE & CO LTD
HEAD OFFICE AND WORKS
HEBBURN-ON-TYNE ENGLAND

DIXON'S DIARY

"Dixon" the Distribution Engineer is a fictitious character and has no relation to any individual, although his counterpart is to be met with at the majority of Supply Undertakings.

Thursday, June 29th.

Never been to Wimbledon before and I'm glad I went although I feel like one of Tom Webster's cartoons — all Tishy-necked.

Quite exciting at times, too! Phyllis got so worked up I couldn't get a word out of her. Got back in time for dinner. Everything O.K. I'm glad we decided to stick to Henley gear — it's worth paying a little more for — you can get away for a day and not meet trouble on the doorstep.

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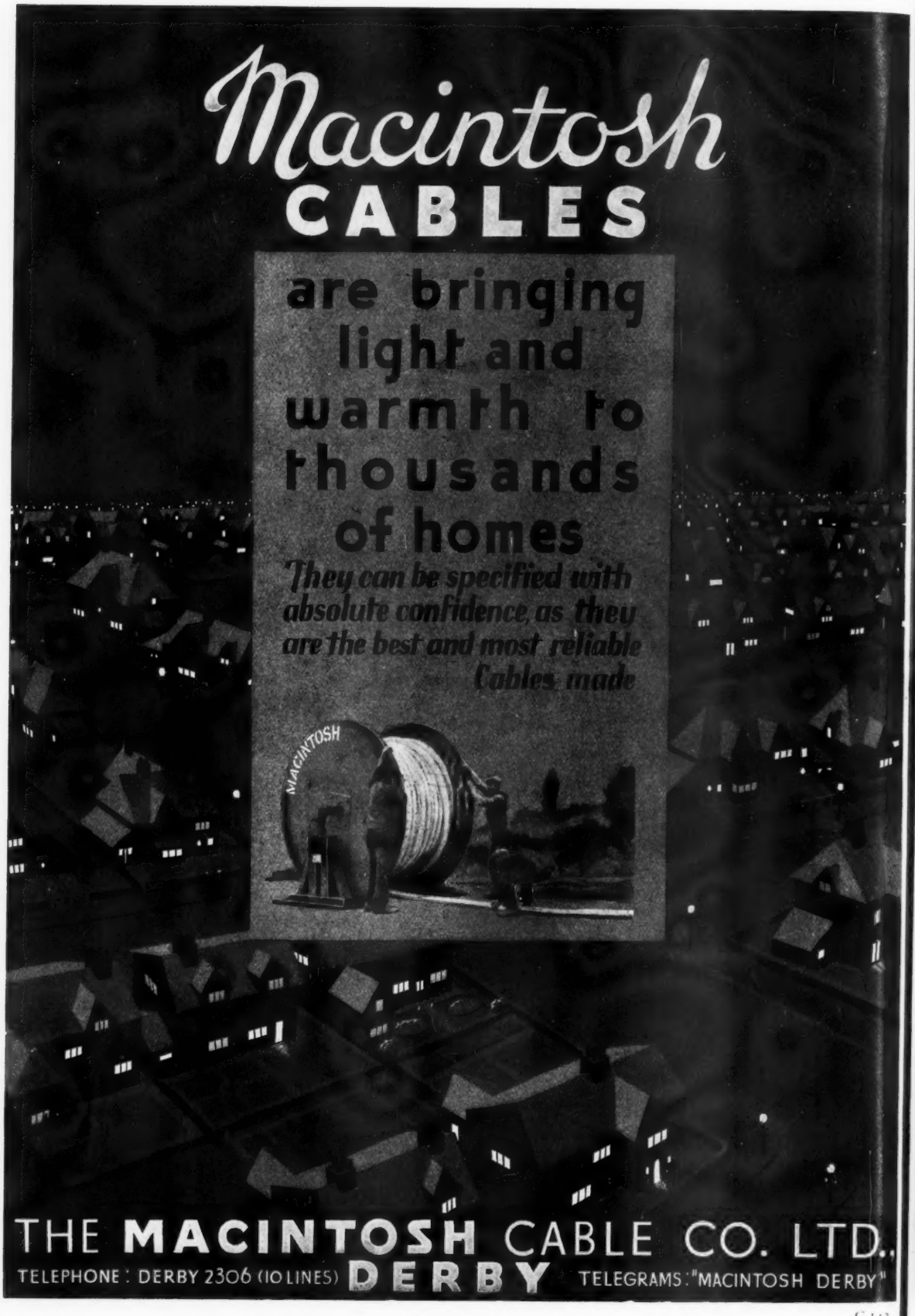
HENLEY

SPECIALISTS IN ELECTRICAL DISTRIBUTION GEAR FOR 40 YEARS.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., HOLBORN VIADUCT, LONDON, E.C.1


Macintosh
CABLES
are bringing light and warmth to thousands of homes
They can be specified with absolute confidence, as they are the best and most reliable Cables made
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THE MACINTOSH CABLE CO. LTD.,
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FINISHES

AND PRESERVATIVE PAINTS FOR THE ELECTRICAL INDUSTRY

In addition to offering the most comprehensive and reliable range of paints and finishes for Structural Equipment, Power Station Plant, and Electrical Appliances, we also place at your disposal a SPECIAL RESEARCH DEPARTMENT with long and intimate experience of the Electrical Industry. Let us help you. Your problems of to-day are probably our discoveries of yesterday and may actually be met by existing "FOOCHOW" materials. These materials are the result of over fifty years' continuous research and can be made to B.E.S.A. Specifications if required.

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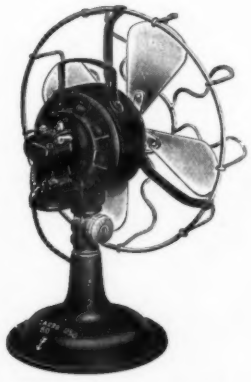
LONDON & MANCHESTER

"MARELLI" FANS

(Regd. TRADE MARK)

(Known the World over.)



OSCILLATING FANS, CONVERTIBLE DESK AND BRACKET.

REVOLVING CEILING FANS.

SILENT RUNNING EXHAUST AND VENTILATING FANS.

WRITE FOR NEW SEASON'S FAN LIST GB/1933.

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A PRECISION STEEL TUBE that has become indispensable to the Industrial World . . . .

'NEW PROCESS'
Electrically Welded
STEEL TUBING

Accurate in gauge.

True to size.

A smooth, clean bore

Easily manipulated.

Combines lightness with strength.

A splendid surface for plating, enamelling and decorative treatments.

In your trade, probably many products could be made better and more economically with the help of NEW PROCESS Steel Tubing. May we send you full particulars and a sample length for you to examine?

TUBE PRODUCTS LTD.
(INCORPORATING H. JOYCE & CO.)
OLDBURY BIRMINGHAM

T.P.28

The VENNER

REBATER

A new instrument for dealing with
OFF-PEAK WATER HEATING, LATE SHOP WINDOW LIGHTING
and similar loads calling for a
SYNCHRONOUS-MOTOR TIME-SWITCH
and
METER

- *Combined in one case.*
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TIME SWITCHES LTD.
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HIGGS (HM) MOTORS
PROPRIETOR WALTER HIGGS ESQUIRE
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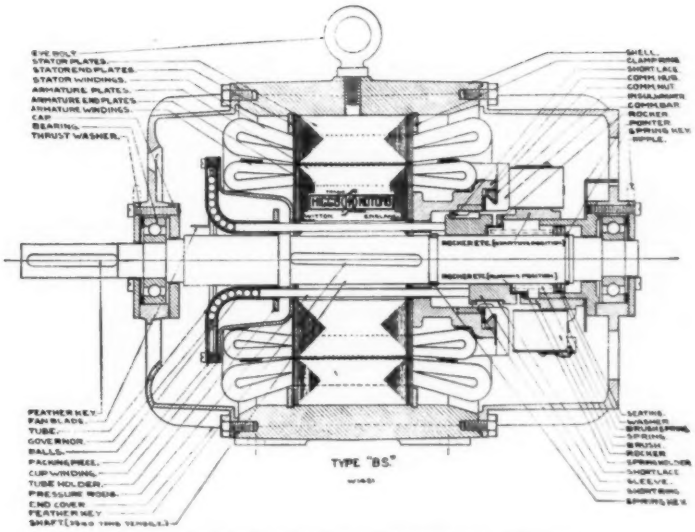

REPULSION START INDUCTION MOTOR
$\frac{1}{8}$ H.P. to 5 H.P.

Ball or Sleeve Bearings.
Totally enclosed Governor Gear.
High Starting Torque.
Electrically reversible if required.
GUARANTEED FOR EVER.

Birmingham, Bristol, Cardiff, Edinburgh, Glasgow, Leeds, Liverpool, London, Manchester, Newcastle, Nottingham, Peterborough, Sheffield, Wolverhampton

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FOR QUALITY
FOR EFFICIENCY

GRIFFITHS BROS. & CO. LONDON LTD.

SPECIALISTS

IN THE PRODUCTION OF

PAINTS · ENAMELS · VARNISHES

FOR PROTECTIVE WORK OF ALL KINDS

INSULATING VARNISHES

- **No. 213 "ARMACELL"** —a clear baking varnish possessing exceptionally good insulating properties. It has a very high dielectric strength at 90°C., giving an ample safety margin at working temperatures. THIS VARNISH CONFORMS TO THE BRITISH STANDARDS SPECIFICATION No. 119-1930.
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- **No. 1255 B "OHMALINE"** — a black baking general utility varnish. Hot oil proof. Very flexible. High dielectric strength which is unaltered by exposure to 95% relative humidity. Possesses exceptional penetrating and internal drying properties.
- **No. 68 "OHMALINE"** — a quick air-drying black varnish specially prepared for URGENT REPAIR WORK, etc. Coils can be coated and dried in a few hours. An efficient varnish indispensable to the Electrical Engineer.

OTHER SPECIALITIES

- **"ANTI-SULPHURIC" ENAMEL** — the finest protector from acid fumes and spray. Quick-drying. Glossy. Insist on "Balloon" Brand.
- **"SHAYDOLITE" LACQUERS** — for colouring electric lamps. All the colours of the rainbow. Applied in a minute. Colours 400 lamps per pint.
- **NATURAL STEEL GREY "FERRODOR" PAINT** — conquers corrosion. The finest protective paint for metal and wood in any climate. Made with INCORRODIBLE pigment and a special weather resisting medium.

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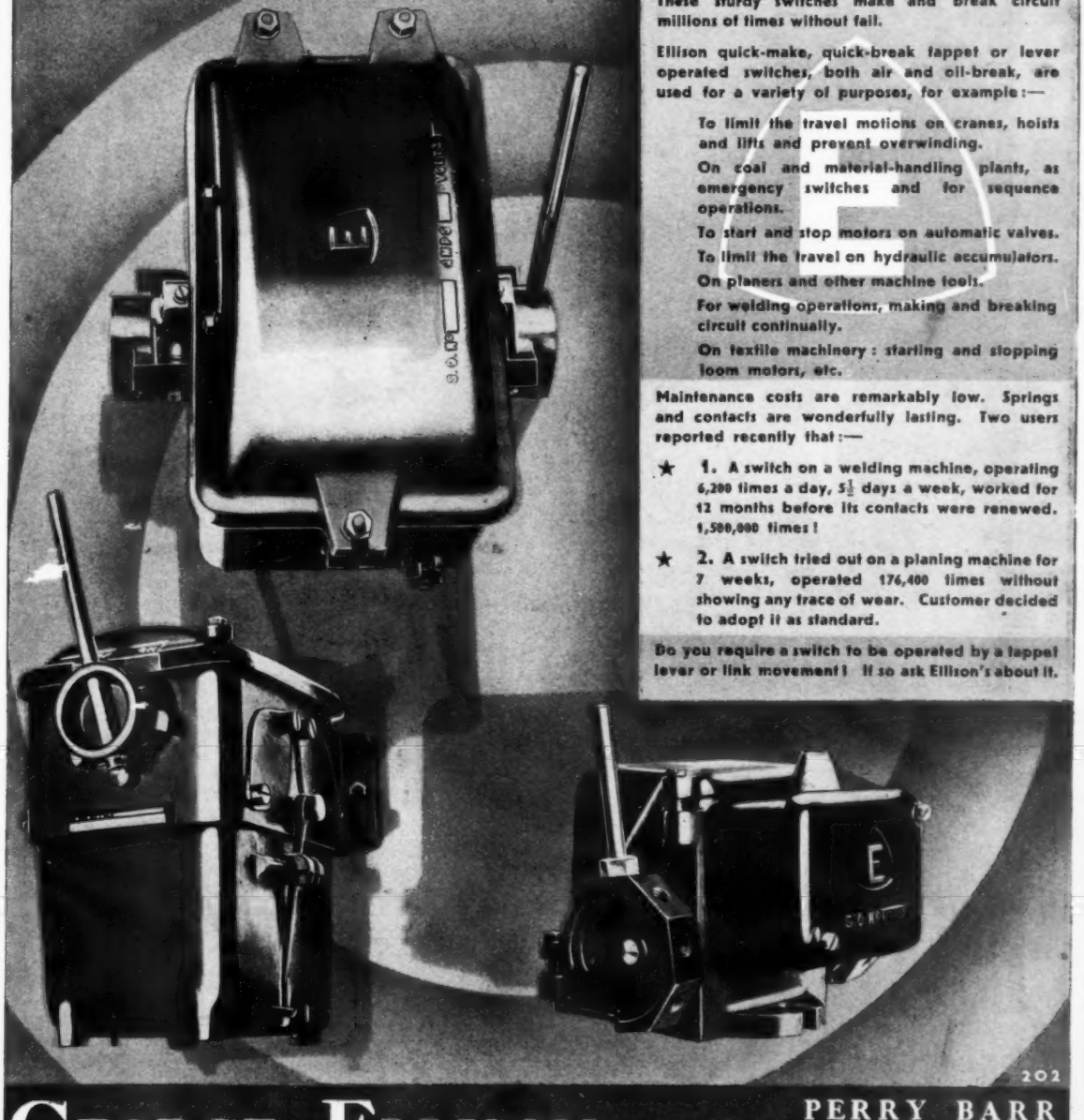
UNFAILING OPERATION of ELLISON Tappet Operated and Limit SWITCHES



These sturdy switches make and break circuit millions of times without fail.

Ellison quick-make, quick-break tappet or lever operated switches, both air and oil-break, are used for a variety of purposes, for example:—

To limit the travel motions on cranes, hoists and lifts and prevent overwinding.

On coal and material-handling plants, as emergency switches and for sequence operations.

To start and stop motors on automatic valves.

To limit the travel on hydraulic accumulators.

On planers and other machine tools.

For welding operations, making and breaking circuit continually.

On textile machinery: starting and stopping loom motors, etc.

Maintenance costs are remarkably low. Springs and contacts are wonderfully lasting. Two users reported recently that:—

★ **1.** A switch on a welding machine, operating 6,200 times a day, 5½ days a week, worked for 12 months before its contacts were renewed. 1,500,000 times!

★ **2.** A switch tried out on a planing machine for 7 weeks, operated 176,400 times without showing any trace of wear. Customer decided to adopt it as standard.

Do you require a switch to be operated by a tappet lever or link movement? If so ask Ellison's about it.

202

GEORGE ELLISON LIMITED PERRY BARR BIRMINGHAM

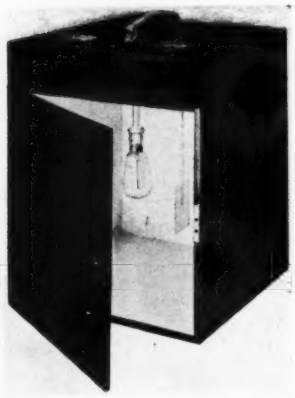
PHOTO-ELECTRIC PHOTOMETERS

A New development in Photometry

THE direct acting photo-cell used in Everett Edgcumbe Photometers is the latest refinement in photometry. It produces a self induced current proportional to the light falling upon it and thus abolishes the use of valve amplifiers, complicated balancing adjustments and external apparatus. It is only necessary to insert the lamp in its holder and the luminous output is immediately indicated direct on the scale of the Lumen-Meter.

Model III "Cube" Photometer is designed for testing large batches of lamps in a quick, accurate and unimpeachable manner by lamp manufacturers, factors, and all large users of lamps. It measures mean spherical candle power or luminous flux by direct indication, without calculation or balance thereby entirely eliminating the personal factor, and is specially designed for high speed operation.

Model III "Cube" Photometer



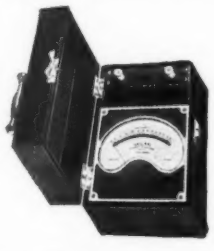
Portable "Lumen Cube"

The "Lumen Cube" is a handy portable instrument for demonstrating the efficiency of lamps to purchasers, and for general testing. The Lumen-Meter, indicating the output of the lamp, is conveniently placed on the top of the case together with a Watt indicator which at the same time indicates the power consumption. The Lumen Cube Photometer is a direct aid to lamp sales and an invaluable adjunct to all who make, sell, or purchase electric lamps.

Everett Edgcumbe make a complete range of photometers in laboratory and portable forms, and every type of electrical instrument used in photometry.

All Everett Edgcumbe Photometers comply with BRITISH STANDARD SPECIFICATION No. 354.

Full particulars will be sent on application to the SOLE MAKERS



SUPERSCALE PORTABLE AMMETERS & VOLTMETERS

possess the highest accuracy for the measurement of the power consumption of lamps and for all industrial testing. They are capable of withstanding the roughest usage without damage, the movements being mounted in sprung jewels which insulate it from vibration and shock.

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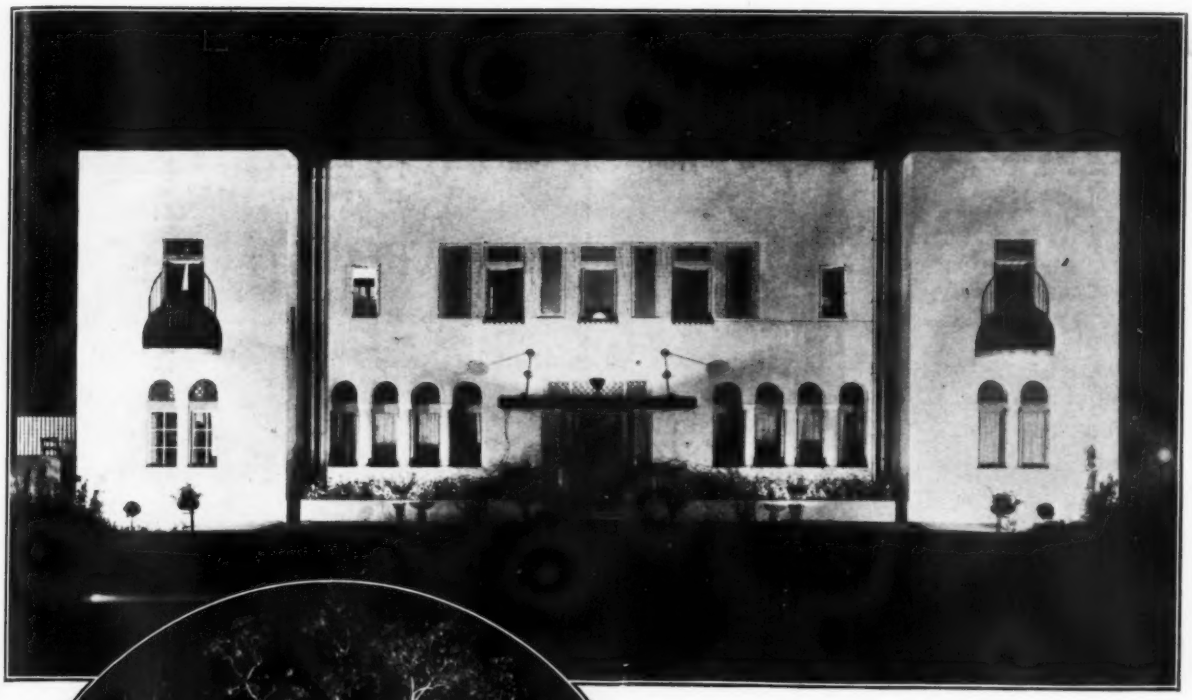

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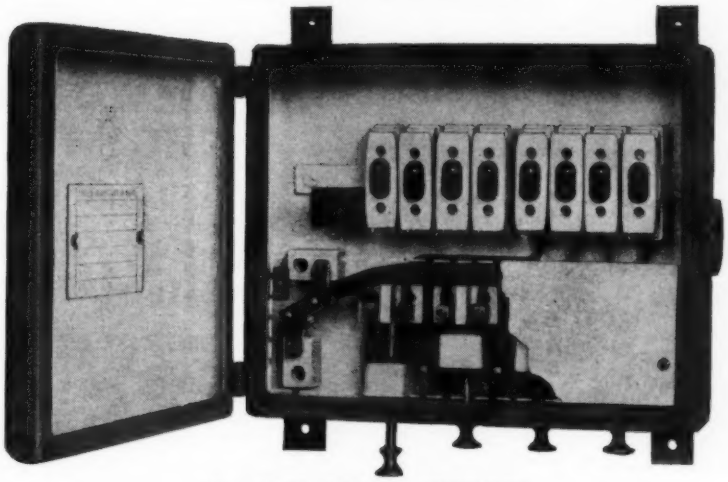

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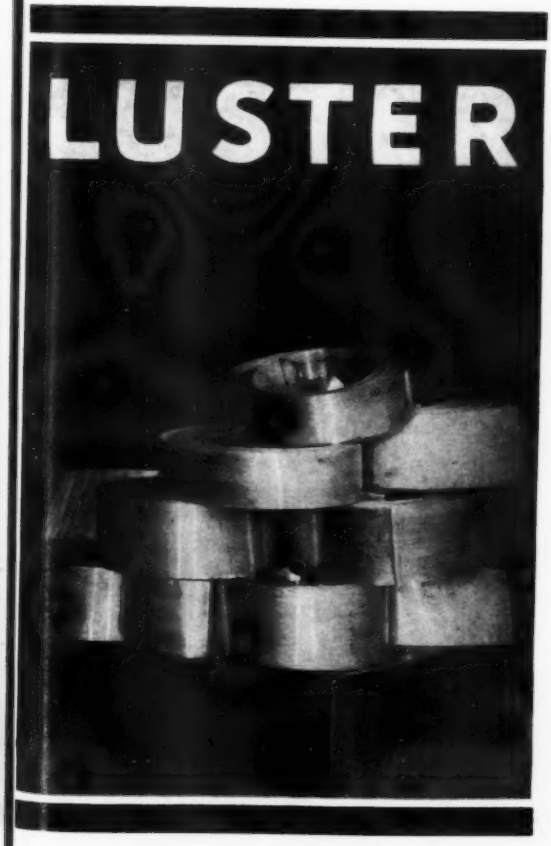

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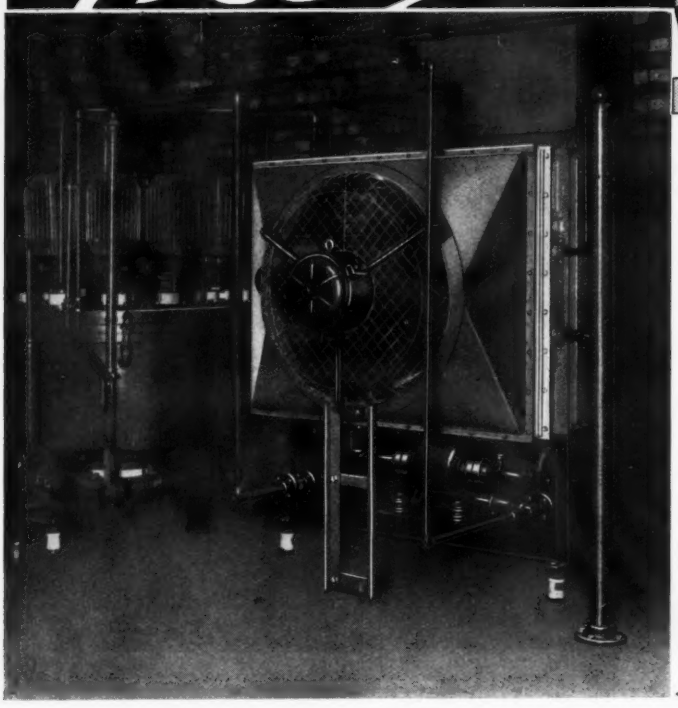

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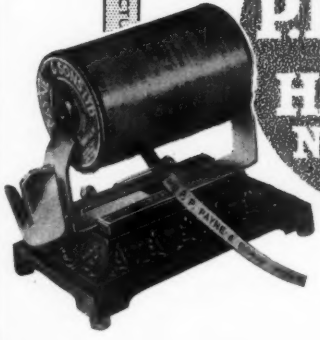

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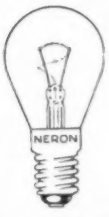

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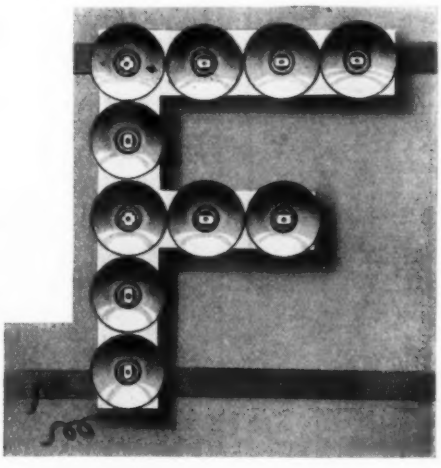

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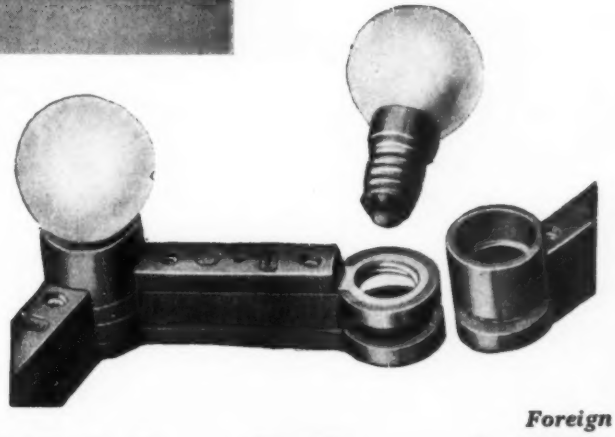

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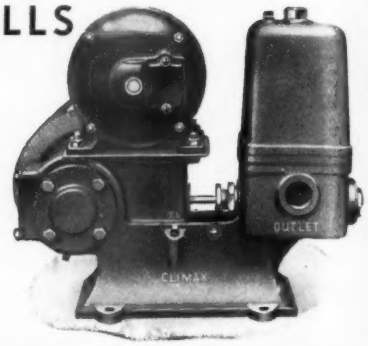

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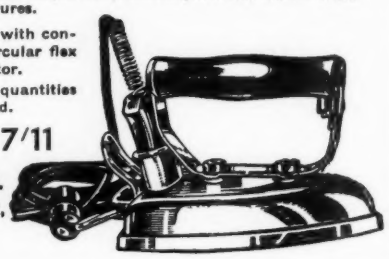

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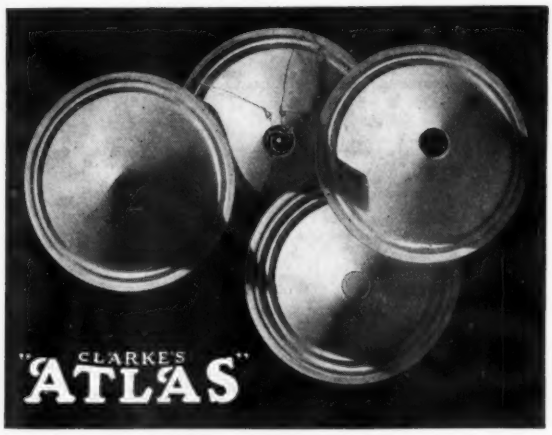

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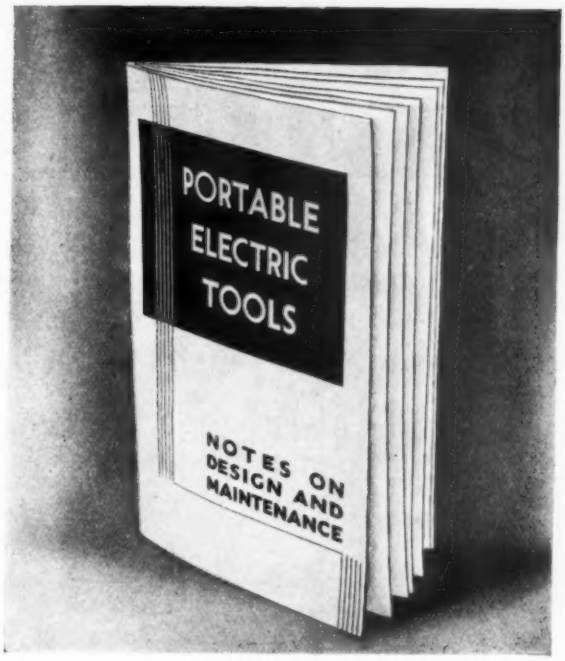

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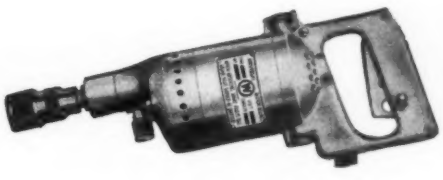

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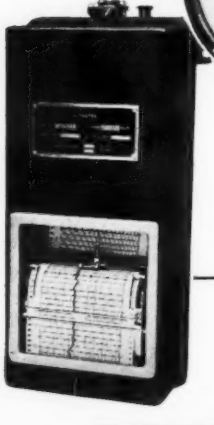

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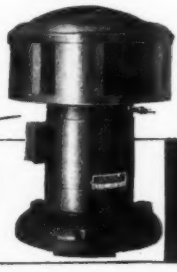

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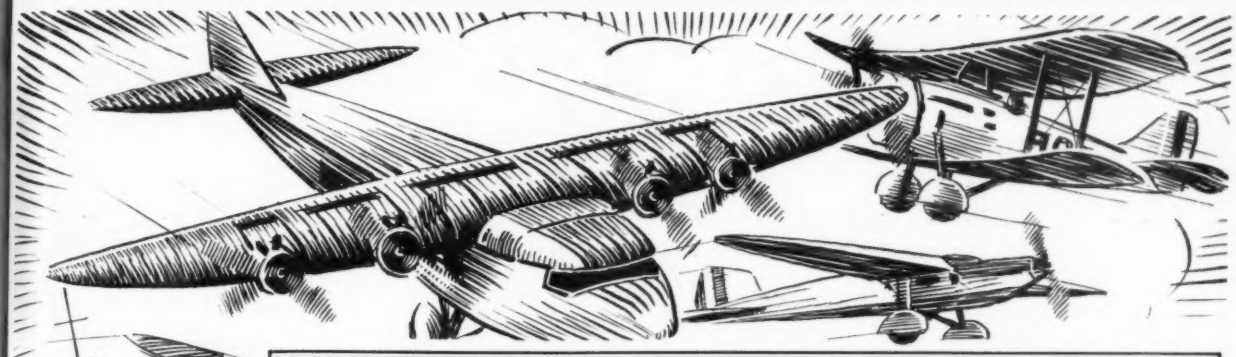

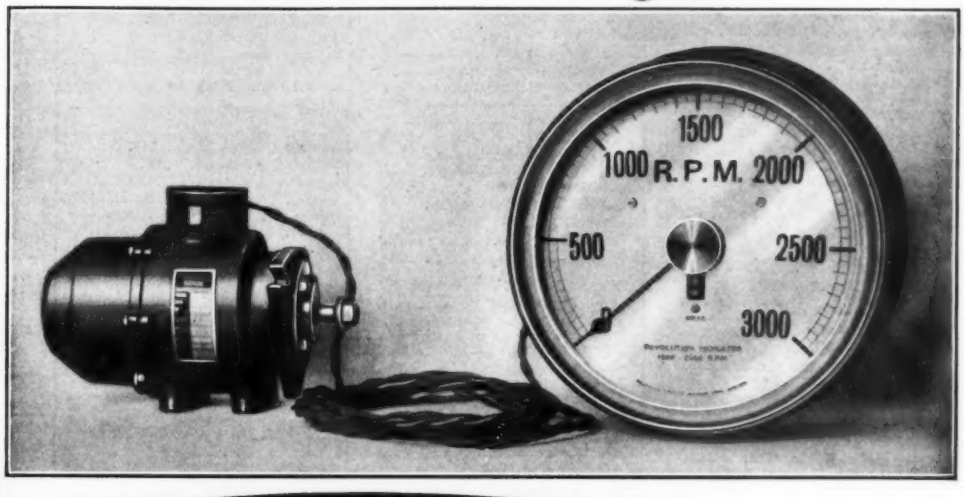

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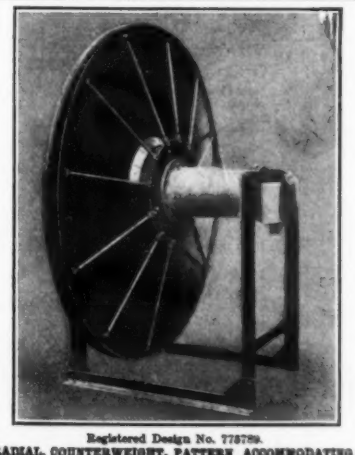

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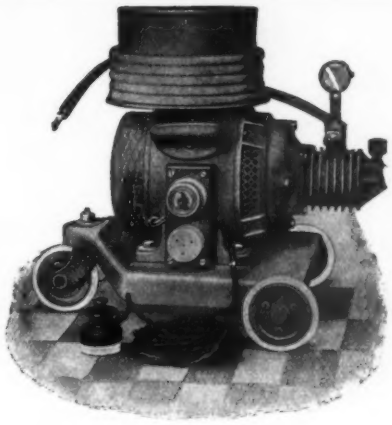

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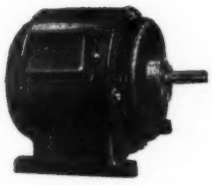

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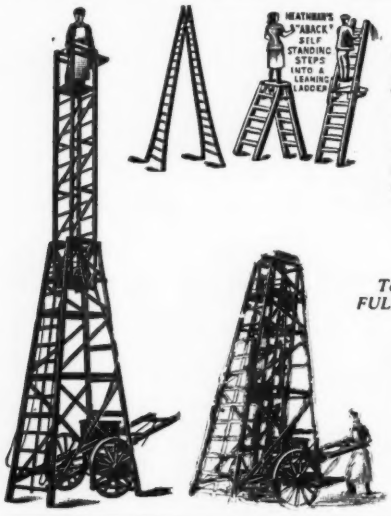
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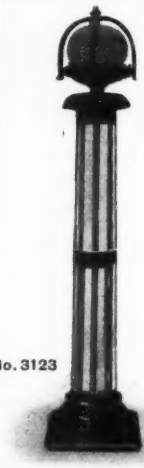

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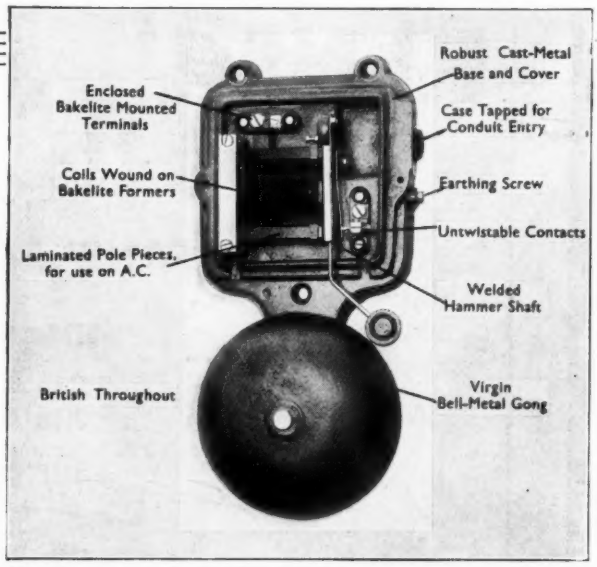

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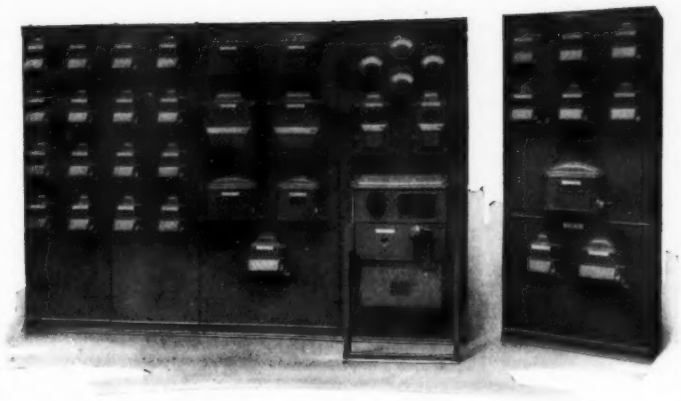

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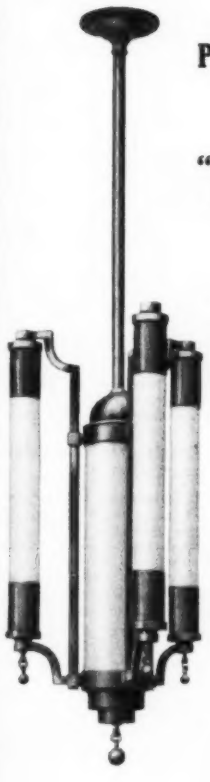

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Copper and Brass Tubes (Solid Drawn)
Birmingham Battery & Metal Co., Ltd.
Bolton (Thomas) & Sons, Ltd.
Clifford (Chas.) & Sons, Ltd.

Current Limiters
Buchan, Cartwright & Co.
Chamberlain & Hookham, Ltd.
Venner Time Switches, Ltd.

Copper Wire
Bolton (Thomas) & Sons, Ltd.
Symonds, R. H., Ltd.

Die Casting
Non-Ferrous Die Casting Co., Ltd.
Thormann, Herbert J.

Dimmers
Cressall Manufacturing Co.
Geipel (William), Ltd.
Mickelwright, Ltd.
Moy, Ernest F., Ltd.
Walters (Austin) & Son, Ltd.

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Brown Bros., Ltd.

Dynamo Brushes
British Thomson-Houston Co., Ltd.
Veritys, Ltd.

Dynamo Repairs
Bertram Thomas.

Dynamos
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Bruce Peebles & Co., Ltd.
Canning & Co., Ltd.
Crypto Electrical Co., Ltd.
General Electric Co., Ltd.
Kandem Electrical, Ltd.
Lancashire Dynamo and Crypto, Ltd.
McClure & Whitfield.
Veritys, Ltd.

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Balmford, W.

Ebonite
Dexine, Ltd.

Electric Drills
Terry (Herbert) & Sons, Ltd.
The Consolidated Pneumatic Tool Co., Ltd.
Wolf, S., & Co., Ltd.

Electric Heating
Artic Fuse and Elecl. Mfg. Co.
Automatic Electric Co.
Barker, Young & Co., Ltd.
Benham & Sons, Ltd.
Bray, Geo., & Co., Ltd.
Carron Co.
Cressall Manufacturing Co.
Dowsing Radiant Heat Co.
Electric Fires, Ltd.
Geipel (William), Ltd.
Homefyre, Ltd.
Hotpoint Electric Appliance Co., Ltd.
Low (Arch.) & Sons, Ltd.
Mayall & Co., Ltd.
Moseley, H. G., & Co., Ltd.

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J. P. Tubular Heater Co.

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McGeoch, W., & Co., Ltd.

Electrical Signs
Walters (Austin) & Son, Ltd.

Electrical Soldering Irons
Brownings Electric Works.
Dowsing Radiant Heat Co., Ltd.
Wolf, S., & Co., Ltd.

Electricity Meters
Aron Electricity Meter, Ltd.
Bertram Thomas.
British Electric Meters, Ltd.
British Sangamo Co., Ltd.
Chamberlain & Hookham, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Kandem Electrical, Ltd.
Landis & Gyr, Ltd.
Metropolitan Vickers Elecl. Co., Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Smith Meters, Ltd.

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Dowsing Radiant Heat Co., Ltd.
Medical Supply Assoc., Ltd.

Enamels
Gittings & Hill, Ltd.

Engineers and Contractors (Electrical)
British Thomson-Houston Co., Ltd.
Clarke, Chapman & Co., Ltd.
Dalyte Electrical Co., The
English Electric Co., The
Johnson & Phillips, Ltd.
Moy, Ernest F., Ltd.
National Register of Electrical Contractors.
Veritys, Ltd.

Engines (Oil)
Crossley Bros., Ltd.
Ruston & Hornsby, Ltd.

Engines (Steam)
Reavell & Co., Ltd.

Escapements
Rotherham & Sons, Ltd.

Extruded Metals
Bolton (Thomas) & Sons, Ltd.
McKechnie Bros., Ltd.

Fans
Berkeley & Young, Ltd.
Davidson & Co., Ltd.
General Electric Co., Ltd.
London Fan & Motor Co., Ltd.
Marelli, E., & Co., Ltd.
Matthews & Yates, Ltd.
Simon-Carves, Ltd.
Veritys, Ltd.

Fibre
Austin & Hayes.
Dacier, Ltd.
Vulcanised Fibre, Ltd.

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G.V.D. Illuminators.
General Electric Co., Ltd.
Kandem Electrical, Ltd.
McGeoch, W., & Co., Ltd.
Typerlite Co.
Veritys, Ltd.
Wardle Engineering Co., Ltd.
Watertight Fittings, Ltd.

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Jenkins, R.

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Midland Electric Mfg. Co., Ltd.
Parmiter, Hope & Sugden, Ltd.
Prentice, Ltd.
Veritys, Ltd.

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English Electric Co., Ltd.
Henley's W. T., Tel. Wks. Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Moy, Ernest F., Ltd.
Parmiter, Hope & Sugden, Ltd.

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Bill, S., & Co., Ltd.
Castle Fuse & Engineering Co., Ltd. (The).
English Electric Co., Ltd.
Foster Engineering Co., Ltd.
McGeoch, W., & Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Moy, Ernest F., Ltd.
Parmiter, Hope & Sugden, Ltd.
Weekes, L. (Luton), Ltd.

Gears
Brown (David) & Sons (Hudd.), Ltd.
Matterson, Ltd.

CONTINUED ON PAGE XXXVIII.

"ZENITE"

(REGISTERED TRADE MARK)

VITREOUS EMBEDDED RESISTANCE UNITS

(WIRE WOUND)

These Units are made in a large variety of sizes and ranges, and are therefore extremely convenient for use in the construction of all kinds of high-class regulating and controlling switchgear.

The Units are neat and compact, and can be supplied with or without brass end caps and connecting clips.

Thousands in constant use for many years in all parts of the world.

PROMPT DELIVERIES CAN BE EFFECTED

Catalogue of Resistances and Units on application

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SOLE MAKERS OF THE WELL-KNOWN "ZENITH" ELECTRICAL PRODUCTS.

Contractors to the Admiralty, War Office, Air Ministry, Post Office, L.C.C., etc.

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Telephone: Willesden 4087-8. Telegrams: "Voltaohm, Willroad, London."

The £.s.d of WASH-BOILER LOAD

Fill in your own prices and see the **PROFIT!**

Charge for Current to Consumer . . **Xd.** per unit

Cost of Current to Supply Authorities **Yd.** per unit

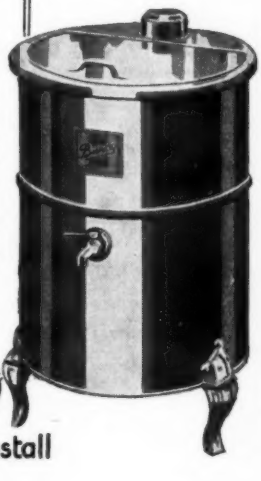
PROFIT Zd. per unit

The average boiler consumption is about **350** units per annum **350 x Zd.**

Installation of 1,000 Burco Boilers would bring in additional revenue of **1,000 x 350 x Zd. per annum.**

Hire and installation show slight profit at only **2/6** per quarter.

Maintenance for seven years, **Nil.**



That's why you should install

Burco THE WORLD'S FINEST ELECTRIC WASH BOILER

Write for Catalogue Dept. R.

BURNLEY COMPONENTS LTD., ROSE GROVE, BURNLEY

1432

Patent Pending. Registered Design.

For direct operation up to 20 Amps 250 Volts. A.C. or D.C.

THE DRAYTON TYPE "RG" THERMOSTATIC ROOM SWITCH

You will like the design of this latest Drayton production. Every point has been minutely considered. Firstly, it is a splendid little switch and is thermostatically and electrically excellent. In addition a special arrangement of assembly permits the base plate to be wired in position during construction and the complete switch to be slipped into place at the last minute. We should like you to see one. Can we arrange an inspection?

Our list 202/E is now ready for distribution. May we forward one?

THE DRAYTON REGULATOR AND INSTRUMENT CO., LTD.

WEST DRAYTON - - - MIDDLESEX

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CLASSIFIED INDEX OF ADVERTISEMENTS—(*Continued from page xxxvi.*)

Generators
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British Thomson-Houston Co., Ltd.
Brush Electrical Engineering Co., Ltd.
General Electric Co., Ltd.
Holmes, J. H., & Co., Ltd.

Glass
General Electric Co., Ltd.

Hack Saw Blades
Neill, J., & Co. (Sheffield), Ltd.

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British Central Elecl. Co., Ltd.

Heat Control
Drayton Regulator & Instrument Co., Ltd. (The).

Heating and Cooking Apparatus
Belling & Co.
Bertram, Thomas.
Bray, Geo., & Co., Ltd.
Dowsing Radiant Heat Co., Ltd.
General Electric Co., Ltd.
Jackson Electric Stove Co.
Low (Archibald) & Sons, Ltd.
Premier Electric Heaters, Ltd.
Revo Electric Co., Ltd.

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Bray, Geo., & Co., Ltd.
Dowsing Radiant Heat Co., Ltd.
Electric Elements Co.
Santon, Ltd.

Hire Purchase
Electric Lamp Factors, Ltd.

Immersion Heaters
Bray, Geo., & Co., Ltd.
Electric Fires, Ltd.
Low (Archibald) & Sons, Ltd.

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Baldwin Instrument Co. (The).
British Thomson-Houston Co., Ltd.
Cambridge Instrument Co., Ltd.
Elliott Bros. (London), Ltd.
Everett, Edgcumbe & Co., Ltd.
Evershed & Vignoles, Ltd.
Ferranti, Ltd.
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Johnson & Phillips, Ltd.
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Nalder Bros. & Thompson, Ltd.
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Weston Electrical Instrument Co.

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Clarke, H., & Co. (M/cr.), Ltd.
Dacier, Ltd.
De la Rue (Thomas) & Co., Ltd.
Ellison (George), Ltd.
Ellison Insulations, Ltd.
Faire Bros. & Co., Ltd.
General Electric Co., Ltd.
Griffiths Bros. & Co. (London), Ltd.
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Lorival Mfg. Co. (1921), Ltd.
Micanite & Insulators Co., Ltd.
Pinchin, Johnson & Co., Ltd.
Ruberoid Co., Ltd.
Spicers, Ltd.
Sterling Varnish Co.
Taylor & Petters, Ltd.
Tullis Russell & Co., Ltd.
Turners Asbestos Cement, Ltd.
West Insulating Co., Ltd.

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Bray, Geo., & Co., Ltd.
Bullers, Ltd.
De la Rue (Thomas) & Co.
Litholite Insulators, Ltd.
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Berry's Electric, Ltd.
Bill, S., & Co., Ltd.
British Thomson-Houston Co., Ltd.
Ellison (George), Ltd.
Ferguson, Pailin, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
McGeoch, Wm., & Co., Ltd.
Metropolitan Vickers Elecl. Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Parmiter, Hope & Sugden, Ltd.
Reyrolle, A., & Co., Ltd.
Sanders, W., & Co.
Simplex Electric Co., Ltd.
Statter, J. G., & Co.

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The Consolidated Pneumatic Tool Co., Ltd.

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Heathman, J. H., Ltd.

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Turnock, G.

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British Glowlamp Works, Ltd.
British Thomson-Houston Co., Ltd.
Crompton-Kye Lamp Sales, Ltd.
Cryselco, Ltd.
Dawson, E., & Co.
Edison Swan Electric Co., Ltd.
Electric Lamp Factors, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
Insular Electric Glowlamp Works, Ltd.
Metropolitan Vickers Elecl. Co., Ltd.
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Tungstalite, Ltd.
Vacuum Lamp Co., Ltd.

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British Oxygen Co., Ltd. (The).

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Radiovisor Parent, Ltd.

Lighting
Beuttell, A. W., Ltd.

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City Electrical Co., Ltd.
Petters, Ltd.

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Barber & Colman, Ltd.
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Ratcliff, J. F. (Metals), Ltd.

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Moy, Ernest F., Ltd.
Veritys, Ltd.

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Brittains Electric Motor Co.
Brook Motors, Ltd.
Bruce Peebles & Co., Ltd.
Brush Elecl. Engineering Co., Ltd.
Bull Motors, Ltd.
Crompton Parkinson, Ltd.
Croydon Engineering Co., Ltd.
Electric Construction Co., Ltd.
Fuller Electrical & Manufacturing Co., Ltd.
General Electric Co., Ltd.
Greenwood & Batley, Ltd.
Higgs Motors.
Kandem Electrical, Ltd.
Lancashire Dynamo & Crypto, Ltd.
Laurence Scott & Electromoters, Ltd.
Mather & Platt.
McClure & Whitfield.
Metropolitan Vickers Elecl. Co., Ltd.
Newton Bros. (Derby), Ltd.

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Normand (The) Electrical Co., Ltd.
S.F.P. Electrical Co.
Sun Electrical Co., Ltd.
Veritys, Ltd.
Wright (Electric Power Specialities), Ltd.

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Brownings Electric Co.
Crewe, Allen & Co.
London Fan & Motor Co., Ltd.
Westminster Engineering Co., Ltd.

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Birkbys, Ltd.
Croydon Mouldrite, Ltd.

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Neon Rays, Ltd.

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Way and Waller.

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British Oil Cleaners, Ltd.

Ozone
Ozonair, Ltd.

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Mitchell, H., & Co.
Tourtel Mfg. Co.

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Macpherson (Donald) & Co., Ltd.

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Litholite Insulators, Ltd.
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Ross, Courtney & Co., Ltd.

Presses
Taylor & Challen.

Pressings
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Rotoplunge Pump Co.
Tangyes, Ltd.

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Display Motor & Access. Co., Ltd.
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Partridge Wilson & Co.
Ray Engineering Co.
Supremus Specialities, Ltd.
Westinghouse Brake & Saxby Signal Co., Ltd.

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Resistances
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Electro Mechanical Brake Co.
Geipel (William), Ltd.
Mickelwright, Ltd.
Moy, Ernest F., Ltd.
Walters (Austin) & Sons, Ltd.
Zenith Electric Co., Ltd.

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Robinson (Lionel) & Co.

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Cressall Manufacturing Co.
Electro-Mechanical Brake Co.
Geipel (William), Ltd.
Isenthal & Co., Ltd.
Moy, Ernest F., Ltd.
Walters (Austin) & Son, Ltd.

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Gilsons.
M.C.L. & Repetition, Ltd.
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Tube Products, Ltd.

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"Beeantee" Illuminations, Ltd. (The).

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Berry's Electric, Ltd.
Bertram Thomas.
British Thomson-Houston Co., Ltd.
Donovan & Co.
Drake & Gorham, Ltd.
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General Electric Co., Ltd.
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Metropolitan Vickers Elecl. Co., Ltd.
Moy, Ernest F., Ltd.
Simplex Electric Co., Ltd.
Statter, J. G., & Co.
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Veritys, Ltd.
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Bulgin, A. F., & Co., Ltd.
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Dorman & Smith, Ltd.
Drake & Gorham, Ltd.
Ferguson, Pailin, Ltd.
Foster Engineering Co., Ltd.
General Accessories Co., Ltd.
General Electric Co., Ltd.
Johnson & Phillips, Ltd.
Lundberg, A. P., & Sons, Ltd.
McGeoch, W., & Co., Ltd.
Midland Electric Mfg. Co., Ltd.
Moy, Ernest F., Ltd.
Reyrolle, A., & Co., Ltd.
Tok Switches, Ltd.
Tucker, J. H., & Co.
Veritys, Ltd.
Weekes, L. (Luton), Ltd.

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Turner, F. (Art Metal), Ltd.

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Dacier, Ltd.
Micanite & Insulators Co., Ltd.

Telegraph Poles
Armstrong, Addison & Co.
Burt, Boulton & Haywood, Ltd.

Telephones
General Electric Co., Ltd.
Gent & Co., Ltd.

CONTINUED ON PAGE XL.

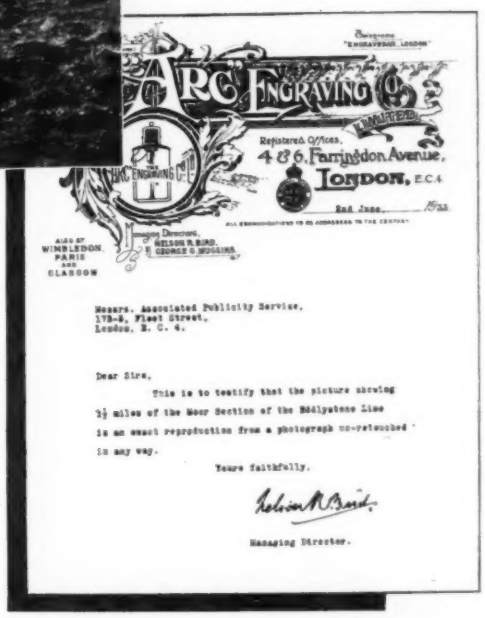
PUZZLE

-find the 20 Poles

Above is a view of about 1½ miles of the Moor Section of the Eddiston Line. There should be 20 "P.B." Callender poles visible.

Alongside is the engraver's assurance that this is an un-retouched photograph.

CAN YOU SPOT THEM?



ARC ENGRAVING Co. LIMITED

Registered Offices,
4 & 6, Farringdon Avenue,
LONDON, E.C.4.

2nd June, 1933

Messrs. Associated Publicity Service,
178-8, Fleet Street,
London, E. C. 4.

Dear Sirs,

This is to testify that the picture showing 1½ miles of the Moor Section of the Eddystone Line is an exact reproduction from a photograph un-retouched in any way.

Yours faithfully,

Managing Director.

THE instance is typical of the unobtrusiveness of the "P.B." Callender pole, the steel pole that is rapidly superseding wood. Its all round dependability, long life, ease of erection and low cost are additional reasons why the "P.B." Callender is the accepted pole for modern rural electrification.

The P/B Callender Pole

FOR ALL KINDS OF HIGH TENSION AND LOW TENSION CABLE SUSPENSION: NOW SPECIALLY MADE FOR EARTH FOUNDATIONS.

PAINTER BROS. LTD.

HEREFORD · ENGLAND

CLASSIFIED INDEX OF ADVERTISEMENTS—*(Continued from page xxxviii.)*

Temperature Regulators
Cambridge Instrument Co., Ltd.
Nathan & Allen.

Thermostats
Rheostatic Co., Ltd.
Venner Time Switches, Ltd.

Time Switches
Landis & Gyr, Ltd.
Nathan & Allen, Ltd.
Venner Time Switches, Ltd.

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Tools (Portable Electric)
Armstrong Whitworth, Sir W. G. & Co. (Engineers), Ltd.
The Consolidated Pneumatic Tool Co., Ltd.
Wolf, S., & Co., Ltd.

Torches
Ever-Ready Co. (G.B.), Ltd. (The).

Traffic Signs
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General Electric Co., Ltd.
McGeoch, W., & Co., Ltd.

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British Thomson-Houston Co., Ltd.
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Ferranti, Ltd.
Foster Engineering Co., Ltd.
General Electric Co., Ltd.
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Metropolitan Vickers Elecl. Co., Ltd.
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Albion Clay Co., Ltd.

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Clifford (Charles) & Sons, Ltd.
Earl, Bourne & Co., Ltd.

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Dacier, Ltd.

Tungsten Wire
Bruce Starke & Co.

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Richardson Westgarth - Brown Boveri, Ltd.

Turbines (Water)
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British Electric Equipment Co., Ltd.
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The Consolidated Pneumatic Tool Co., Ltd.

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Crane (Fredk.) Chemical Co., Ltd.
Enfield Cable Works, Ltd., The

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Veritys, Ltd.

Wall Nails
Snow, T. F.

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Burnley Components, Ltd.

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Low (Archibald) & Sons, Ltd.
Nathan & Allen, Ltd.

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Venner Time Switches, Ltd.

Water-power Engineers
Boving & Co., Ltd.
Gilkes, G., & Gordon, Ltd.

Welding Plant
Marryat & Place.

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A.C.E.C. (Ateliers de Constructions Electriques de Charleroi).
Armorduct Cable Co.
British Insulated Cables, Ltd.
Cable Makers' Association.
Callender's Cable & Construction Co.
Concordia Electric Wire Co., Ltd.
Connolly (Blackley), Ltd.
Derby Cables, Ltd.
Enfield Cable Works, Ltd.
Foster Engineering Co., Ltd.
Geipel (William), Ltd.
General Electric Co., Ltd.
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Henley's, W. T., Teleg. Works Co., Ltd.
Hooper's Telegraph & I.R. Works, Ltd.
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Mersey Cable Works, Ltd.
Saxonia Electrical Wire Co., Ltd.
Siemens Bros. & Co., Ltd.
Union Cable Co., Ltd.
Wandleside Cable Works, Ltd.
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West Insulating Co.

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Smith, F., & Co., Ltd.

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Caplin Engineering Co., Ltd.

Wire Guards
Carter, H. W., & James, Ltd.

Wireless
General Electric Co., Ltd.
Marconi Wireless Telegraph Co.
Ward & Goldstone, Ltd.

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Bowker, S. O., Ltd.

Woodwork (Electrical)
Wootton & Co., Ltd.

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FOR THE ELECTRICAL, MOTOR AND GENERAL ENGINEERING TRADES.

SPECIAL QUOTATIONS GIVEN FOR LARGE QUANTITIES.

M.C.L. AND REPETITION LTD.
POOL LANE, LANGLEY, BIRMINGHAM.

• CUT-DOWN-COSTS •

The "Handi-Spray" Plant, here illustrated, is a compact portable Spray-Paint Outfit, which will considerably cut down the cost of finishing manufactured articles, such as radiators, stoves, meters, etc., and produce better results. It will run from an ordinary lighting point.

Price complete, and ready for work
£18.10.0

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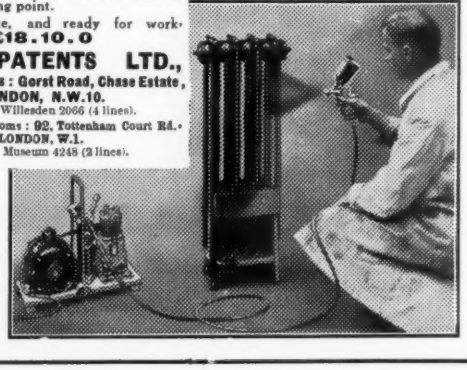

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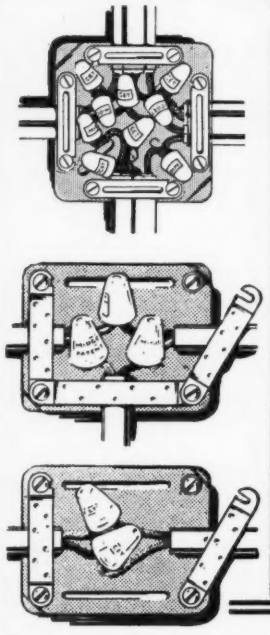

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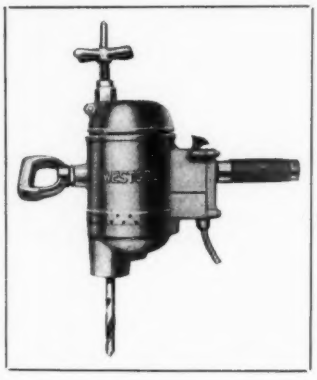

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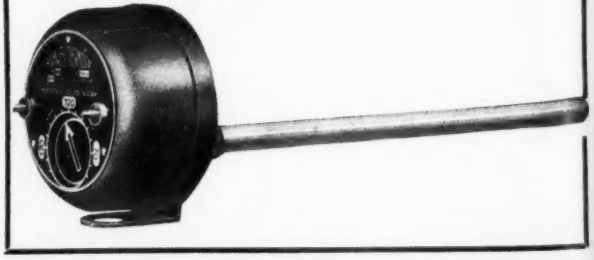

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for Pole, Platform, Wall or Floor Mounting

2858

2892

Many noteworthy features are incorporated in the construction of PEEBLES Distribution Transformers which are a remarkable advance on anything hitherto obtainable from other Makers.

The upper illustration shows transformers fitted with PEEBLES patent tapping units, while the lower one depicts transformers fitted with externally operated tapping switches. With tapping switches clear indication of the tapping in use is given externally and a very convenient means of ratio adjustment is provided. Danger of moisture or dust getting inside the tank if such adjustment must be made out-of-doors during bad weather is eliminated.

PEEBLES Distribution Transformers are giving most excellent service under severe operating conditions at home and abroad.

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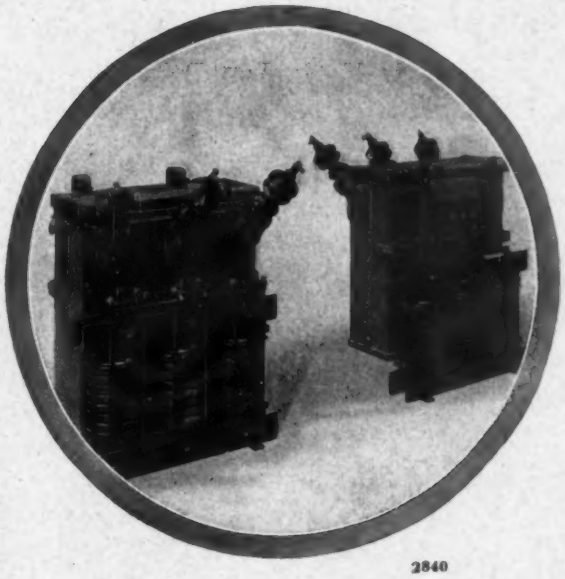

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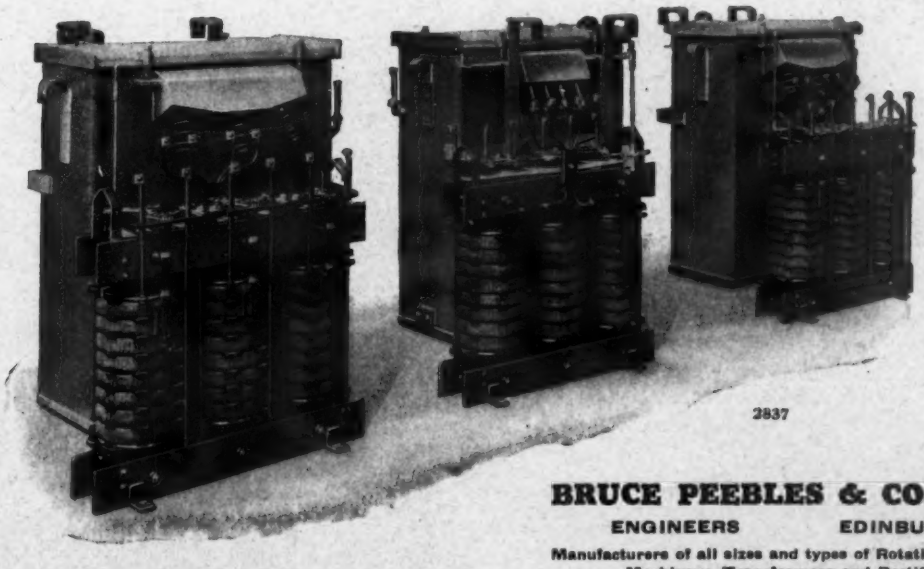
Illustrations show Transformers for use on 11,000 volt, three phase, 50 cycle circuits.

The tanks are fitted with hangers for cross-arm mounting on either single or "H" Poles.



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and ensure the continuous satisfaction of your customers

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